EFFECTIVE CONSTRUCTION PROJECT COMMUNICATIONS

Submitted by: John Freeman

Supervisor: Dr Corrinne Shaw

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Declaration.

I declare that this dissertation is my own unaided work. It is being submitted for the degree of Master of Philosophy in Engineering Management at the University of Cape Town. It has not been submitted for any degree or examination at any other university.

Name: John Freeman

Signature: 

Date: 24 October 2015

Abstract

Large construction projects involve numerous participants, many of whom do not participate for the entire duration of the project. Participants often come from very different cultural and linguistic backgrounds. In the case of many large projects, the levels of education of these participants also vary widely, from graduate professionals to labourers with only a basic education.

For a project to be developed, executed and handed over to the owner efficiently, the activities and delivered outputs of the project participants need to be coordinated. This requires effective communication to and feedback from all stakeholders. Project communication systems therefore have to take into account the differing backgrounds and information requirements of the participants.

The execution of a high proportion of construction projects is negatively affected due to ineffective project communications. This gives rise to the concern that construction project communications can contribute to late or inappropriate actions by participants that can negatively affect project delivery. This informed the research question: “How can project team communication systems be optimised to ensure that all stakeholders have all the information and understanding required to function efficiently, effectively and timeously?”

This research study sets out to answer this question.

The first objective of this study was to identify the main factors that cause project communications to be ineffective. The second objective was to develop a theory relating to effective project communications systems that could be useful in developing practical solutions to project communication problems.

I had access to two major construction projects and selected these as my sources of data. A research methodology was therefore required which would lend itself to direct field observations and to identify a core focus area. Principles from grounded theory methodology (Glaserian) were deemed the most suitable for this application due to its characteristic of narrowing the focus of a broad field of study and identifying a core variable that can be investigated.

Conclusions were reached and a theory developed regarding a core variable that could be adjusted to achieve more effective construction project communications.

The core variable “Developed Usability of Construction Project Communication Environment” was used as a focus for developing the final theory of effective construction project communication systems. The conclusion reached was that project managers should ensure that an environment that was perceived by project participants to be easy to use and effective in eliciting appropriate actions should be developed as early in the project’s life as possible.

The potential for transferability to other organisational contexts is discussed in the final chapter.

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Many people other than I made the completion of this dissertation possible.

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Contents

List of Figures

List of tables

1. Chapter 1: Introduction.

1.1 What is a project?

A project can be described as a given, unique task which can be planned, is limited in time, complex in its implementation and subject to evaluation. According to Belout (2004) many definitions of projects exist, but “most researchers agree that projects generally possess the following characteristics: Limited budget, schedule, quality standards and a series of complex and interrelated activities” (Belout, 2004, p. 2).

1.2 Project teams and stakeholders

A project is carried out by a project team (a group brought together specifically in order to plan and execute the project) in cooperation with other project stakeholders such as the client and local authorities. According to Dainty (2006) construction projects are collective efforts, coordination of all participants’ activities is needed in order to complete the project in a structured and orderly manner. Effective communications must take place between the participants in any project in order to ensure that the actions of all participants are coordinated.

1.3 The role of communications in projects

There are many definitions of communication. In this dissertation, communication is defined as the act of using words, sounds, signs or behaviours to express your thoughts or feelings to someone else (Webster, 2015). Aucoin (2007) describes communications in any organization as aimed at achieving the following outcomes:

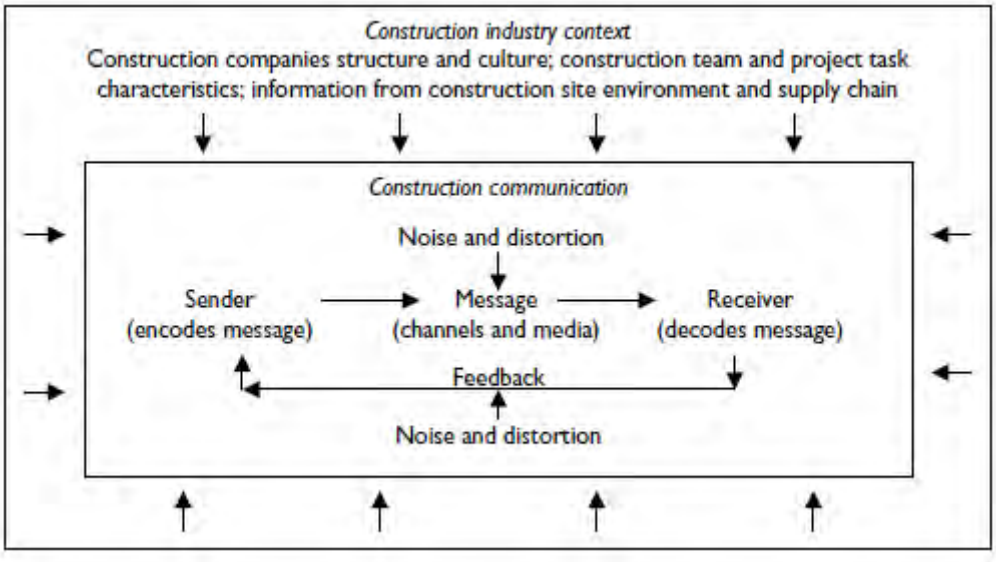
- Achieving coordinated results
- Managing change
- Motivating employees
- Understanding the needs of the workforce.

A major function of project communication is to transfer information that will enable and commit the recipient of a communication to carry out actions that will take the project forward and to provide feedback as to the outcomes of these actions and occurrences in the project environment to stakeholders. This is true for communications within the project team as well as between the project team and external stakeholders such as the client, supply chain members and various disciplines. Transmitting, receiving and acting on information forms the major part of any project involving multiple stakeholders and much of this is normally facilitated by the project manager.

1.4 Methods of communication

Figure 1.1 Construction industry context and communication process

Source: *(Dainty, 2006, p. 58)*



The model ignores such factors as social and interpersonal dynamics and organisational environment. These factors are dealt with in later chapters.

Current construction projects are frequently very large, producing assets worth billions of rands. Such large projects require inputs from project teams, sometimes numbering thousands, as well as from other stakeholders. The individuals comprising the project teams and stakeholders may be geographically dispersed. I had the opportunity to observe a very

large construction project as part of this study that had project team members based in the United Kingdom, Singapore, India and two locations in South Africa, where the construction phase of the project was being executed. This geographic dispersion did not end there. Manufacturing of equipment required for the project was carried out locally as well as in several countries in Europe and Asia. In order to ensure a smooth flow of construction activities, these manufacturing activities had to be integrated into the overall project schedule and monitored for quality and on time completion. These equipment manufacturers therefore also became stakeholders in the project. As a member of the engineering group of the EPCM (engineering, procurement and construction management) contractor I was well positioned to see the interactions between all participants and the difficulties that arose as a result of the factors mentioned above.

Projects of this magnitude usually take many years from start to finish, and it should be noted that some staff will leave during the project's execution. Undocumented communications that have been internalised by these individuals is lost due to this process. They will be replaced by new members, who may have no knowledge of previous project information communicated. These new team members will take months to gather and understand previously communicated information, settle in and start functioning efficiently as part of the project team.

In order to ensure that the numerous project stakeholders receive the required information to act on, organisations are increasingly using electronic systems for distributing and storing formal, documented information for use by the appropriate role players in the project. These information and communication technology (ICT) systems are referred to by various names e.g. DDM (or Document Distribution Matrix). ICT systems should not be seen as communication systems but rather as tools used within the project communications system.

Figure 1.2 Simplified construction project communication paths

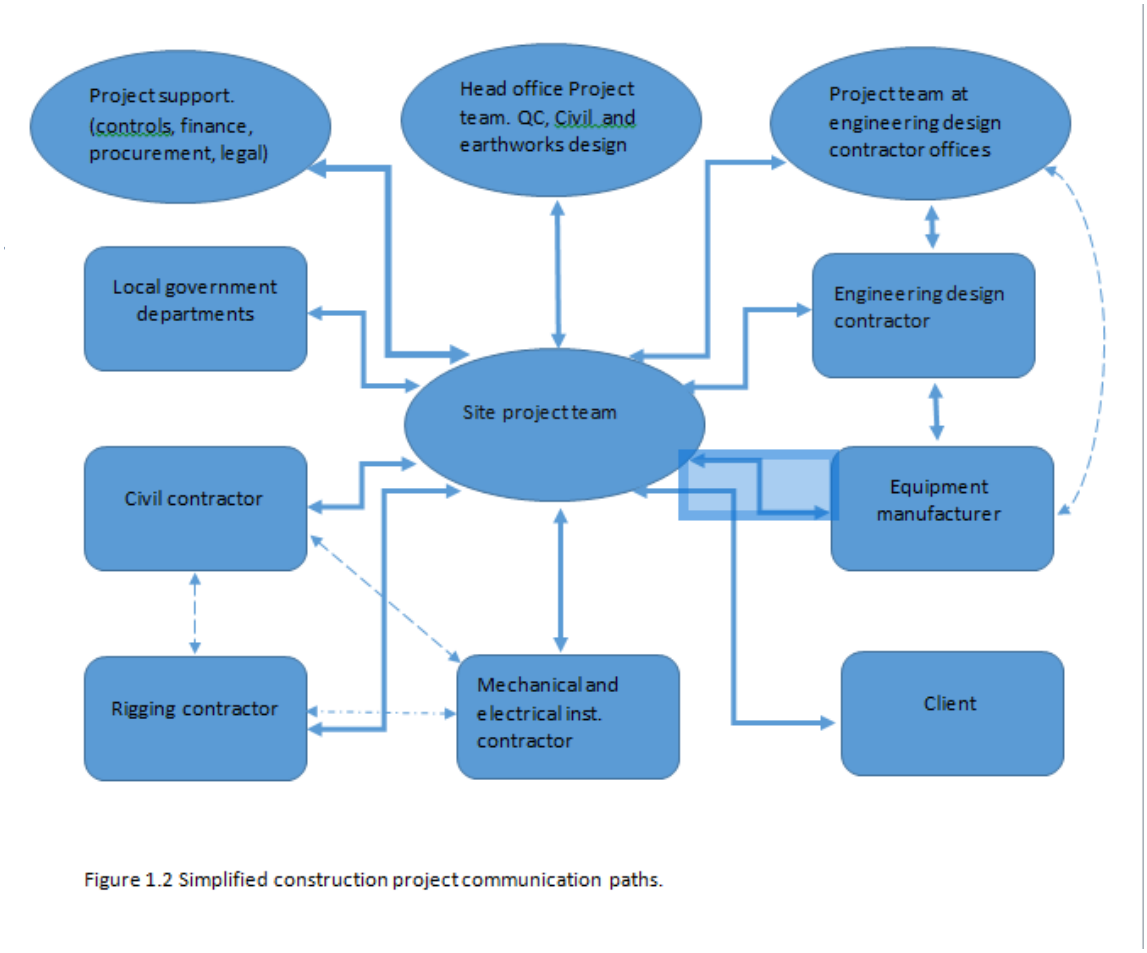


Figure 1.2 Simplified construction project communication paths.

For large projects with hundreds or even thousands of team members and other stakeholders, the D.D.M. sets out to issue and record transmittals of information to the people who require it. D.D.M. systems are designed as tools to be used to ensure that stakeholders are not overwhelmed by numerous communications that they do not require in order to carry out their work effectively. Thus, if the D.D.M. is correctly set-up, each communication is only issued to the individuals who need the information. As its name implies, the D.D.M. only distributes information contained in documents, such as drawings, scopes of work, responses to technical queries etc. The transmittal of these documents is done by a document control department which records the date of distribution and secures proof of delivery to the recipient. The initial decisions as to the information needs of participants and their responsibilities and accountabilities is decided during the project planning phase and the DDM is configured accordingly. Note that each project stakeholder's responsibilities and accountabilities and thus their

information needs vary as the project progresses, so the DDM needs to be updated at intervals.

It should be noted that although I.C.T. systems are a powerful tool within a project communication system, they exclude the important component of human interaction which facilitates understanding and problem solving. (Dainty A. M., 2006)

Information is also communicated during meetings (with attendance registers and main points captured in minutes) and emails, letters and faxes. Although many of these transactions are not captured and distributed by I.C.T. systems, copies are generally kept by the sender or meeting convener as proof that the communication took place. According to Dainty (2006) much relevant, useful information is exchanged by less formal, sometimes verbal means such as telephone and face to face conversations. These communications are generally not recorded and can be forgotten or refuted later if not acted upon.

Modern projects are usually schedule driven and it is important that as well as being complete, correct, achievable and understandable, communication is timeous; i.e. the recipient must be able to act on the communication within the time allowed by the schedule. Due to the ever present time pressures on construction projects, sending, receiving and understanding communications should take as little time as possible. (Wikforss, 2007)

1.5 Poor project performance and communication issues

The involvement of stakeholders (project team members as well as others) is often for some of its phases only. Project participant groups are therefore often short lived and interpersonal transactions and networks change throughout the project's life cycle as individual team members are introduced to and removed from the team during the project's phases. This means that the project environment is not characterised by the relative stability of permanent organizations and project participants have to interact in unfamiliar environments and situations. Poor performance of construction projects has

been linked to poor communication practices, organisational fragmentation and lack of integration between the design and production processes (Dainty, 2006). Aucoin (2007) points out that recent research in the field of project management has concluded that poor communication is a pervasive problem and results in cost over-runs, late delivery and other undesired outcomes. “Good communication and common understanding are critical to project success, and poor communication is a pervasive problem”. (Aucoin, 2007, p. 7)

1.6 The temporary organisation

Packendorff (1995) argues that a project should be viewed as a temporary organization rather than a tool for carrying out a task. Viewing the project as a tool ignores the motives and agendas of the individuals in the project organization. This can lead to projects suffering from the same dysfunctionality that other organizations do. (Packendorff, 1995) This view of a project was found useful when I analysed field observations of project communication effectiveness during my study.

1.7 The negative effect of lack of effective communication on construction projects

Ineffective communications in construction projects have been closely associated with poor project performance for many years. Construction project communication that gives rise to late or inappropriate actions by participants; or no action at all will negatively affect project delivery. Required actions by project stakeholders are sometimes carried out late or incorrectly due to poor communication practices. There are many reasons for project communications failing; lack of understanding, information overload and poor quality of information as being some of the chief culprits. (Dainty, 2006)

My initial search of literary sources in the field of project management highlighted the level of poor project performance that prevails. My work experience in the project field also made shortcomings in project execution visible to me. Many aspects of the poor

performance of projects seemed to be associated with ineffective communications. However I was able to find very little research into the field of project communications that were helpful in understanding why the current systems of communication often fail. Most project management sources, when discussing communications did not explore the root causes of communication failures, but simply offered organizational charts and mentioned the role of ICT systems without analysing the communications environment in the context of the temporary organisation. If communication failures can cause costly project delivery problems, it seems that there is a need for more research into the field.

This research sets out to address the above concern by answering the question:

How can project team communication systems be improved to ensure that all stakeholders have all the information and understanding required to function efficiently, effectively and timeously?

The outline of the dissertation is structured with the following chapters.

1.8 Overview

This dissertation is structured according to the following chapters.

Chapter 1: Introduction: Description of the topic, research question and outline of chapters.

Chapter 2: Literature review. Various books, journal articles and internet sites are used as sources of information which form part of this study. Earlier references were of a general nature, while references to specific areas that emerged from the research were used as data toward the end of the research process.

Chapter3: Methodology. Glaserian Grounded Theory was chosen as a research method. The use of grounded theory principles provides an inductive approach when the specific

focus of the research is initially undecided. The methodology is in line with the epistemological approach adopted and is discussed in detail in this chapter.
Three main sources are used to gather data: 1) Academic books, scholarly magazine and internet articles 2) observations on site at a major South African construction project and 3) interviews with project stakeholders. A much smaller construction project in Saudi Arabia was studied as the focus of the research narrowed. Interviewees were selected for
their likely experience of project communications at various levels of seniority i.e. purposive sampling. Field observations were made of events arising from a communication, either where the outcome was the desired one or not.
Key variables are identified from the information gathered, and variables are identified.

Chapter4: Findings. The result of the analysis was the preliminary theory of effective project communications. From the preliminary theory a core variable is identified, theoretical sampling is applied to it and this is used develop the final theory of effective construction project communications.
A qualitative causal loop diagram (CLD) showing the Final Theory of Project Communications is then developed. This is followed by a narrative explaining the logic used in construction of the CLD.

Chapter5: Discussion of Findings. The findings of chapter 5 are discussed here. Specific areas of discussion include a critique of the research and transferability of the theory developed to other management situations. These are discussed against the background of ethics, reliability, credibility, confirmability and transferability.

Chapter 6: Conclusion. Conclusions that can be drawn from the study are set out and discussed.

2 Chapter 2: Literature Review

2.1 Introduction

Literature was sourced to provide substantiating data to support claims made in the various sections of this dissertation. In this chapter the focus is on literature produced by researchers who have conducted studies on similar or relevant topics. It was sourced and used for purposes of comparison with the data collected from interviews and observations in order to enrich the analysis, contribute to theory building and conclusions of this thesis and to strengthen the conclusions reached in relation to the research question.

The literature search sourced books and scholarly journal articles via data bases. Internet searches for scholarly articles on appropriate websites were also done.

2.2 Literature review relevant to project management and variables identified in the study

The inductive approach taken for the development of a theory that answered the research question had implications for the way in which the literature review was conducted. While deductive approaches foreground the literature review, inductive approaches are consulted to substantiate or challenge the research findings emerging from the data. A characteristic of the grounded theory methodology is a narrowing of focus as a core category is identified. In the early stages, works on the parent discipline of management research and project management were sought. Later, as the focus of study narrowed and the theory started emerging, literature was sourced that enquired into the specific focus of the research, namely construction project communication systems.

It is interesting to note that, despite the high cost to projects of communication failures, little research work focusing on this field was found. (Aucoin, 2007) (Dainty, 2006) (Packendorff, 1995)

2.2.1 Perspectives on project management

A range of views on project management were encountered in the academic books and articles gathered for the research. Some authors concluded that projects should be managed strictly to a pre-determined procedure and organisational structure while others emphasized the importance of individual and group motivation and the sense of common purpose in the performance of project management teams. Authors supporting the latter view included. Packendorff (1995) asserts that rather than being viewed as "tools" projects should be seen as temporary organizations with the motives and ambitions of participants being important considerations. He also argues for the need for descriptive empirical research to produce mid-range theories of project management with project participants as the source of information. This view implies a shift in epistemology from the positivism of the normative analysis that currently prevails in project management research to that of constructionism.

Aucoin (2007) takes a relativist (rather than positivist) approach and concludes it is companies' failure to establish "compelling reason, sense making" and "common understanding" among project teams and individual members for executing the project that is a frequent cause of project failures. The motives and motivation levels of individuals and groups within the project is also noted in (Aucoin, 2007, p. 8). Aucoin attributes the success or failure of complex projects to the motivation of participants rather than clearly defined rules and procedures. This aligns with Packendorff (1995) who points out that the existence of a project cannot be explained purely in terms of its inputs and outputs. The motives of the participants should also be taken into account when studying a project.
Aucoin's (2007) conclusions were based largely on data from statistical studies on large numbers of projects rather than the use of data collected directly from project participants. He did not place as much emphasis on the role of the project manager as some of the other writers did. Aucoin (2007) also stresses the need for organizational learning. He concludes

that poor communication is an important contributor to shortfalls in these factors. Aspects of the "right brain" approach advocated by (Aucoin, 2007) were supported by data collected in this study. Instances where individuals and groups allowed mistrust and lack of overall understanding and motivation to affect their actions were observed.

Aucoin (2007) also acknowledges the importance to the project of the individual participant's motivation. He points out the importance of the project manager's role in improving individual motivation and in team building within project groups.

Neither Dainty (2006) nor Aucoin (2007) mentions the need for viewing a project as anything other than a means of achieving a unique, pre-defined outcome. Dainty (2006) however, does support the view that there is a need for research on communication as a route to more effective individual and organizational learning, human resource management, and to trust and collaborative working in groups.

The role played by informal communications was noted in the literature although different views on its value were expressed.

Table 2.1 (Appendix 1) summarises the focus and theories generated or conclusions reached in the main literary sources used.

2.2.2 Focus area and key variables literature review - Project communication

As the focus of the research narrowed and the effectiveness of construction project communications was identified as the central field of study, only the relevant sections of works relating to this field were consulted. Below is the review of this literature with reference to the variables identified in this study.

2.2.3 Level of appropriate use of formal communication tools by participants.

Most of the project communications literature sources used addresses the subject of formal project communications both between stakeholder individuals and groups. Authors place differing emphasis on formal communication design and procedures and the informal communication that occurs in projects. Some devote surprisingly little space to the subject of how easy or difficult it is to work with the formal system, motivation, diverse language and culture and emotional maturity. (Frame 2003; Dainty 2006; Wikforss 2007)

Frame (2003) describes project teams as “problem solving tools” and focuses on the importance of formal project communication structures. He does however also recognise the role of informal communication. He highlights the value of using communication media that are appropriate for the type of information being transmitted and the prevailing situation. Media that allows for two way communication is usually preferable as it facilitates understanding between parties. Frame (2003) main focus, however, is on the structures and procedures rather than on the needs and motivations of individuals and groups. This does not address the right brain factors that Aucoin (2007) focuses on.

Aucoin (Aucoin, 2007) does not propose specific project communication structure/procedure solutions but instead addresses the “right brain” issues that he believes are frequently neglected in current project management. According to Aucoin (2007), motivation and emotional maturity in project participants are key factors in facilitating effective project communications as well as other aspects of project execution. Dainty (2006) acknowledges the existence and importance of informal communications between individuals and groups. He concedes that although formal structures for communication between organizations and between individual project participants are vital and reinforce hierarchical relationships they are often not as suitable for reaching agreement as informal channels are. Informal flows of information which occur because of individual participants’ internal motivations contribute much to the efficacy of communications in temporary organizations. To fully understand the communications and motivations in organisations therefore requires an understanding of both the formal and informal structures that exist. Dainty (2006) points out that the informal project communication structures are fluid and change as the project proceeds. He stresses the importance of understanding communication *processes* in organisations in an effort to understand why those organisations succeed or fail. In the absence of effective communication procedures. Dainty (2006) contends that the required internal and external flows of complex information cannot be managed. Dainty (2006) also emphasises the need to understand the organisational culture as a *context* for the information flow.

Wikforss (2007) discusses the influence exerted by communication systems and their supporting information and communication technology (ICT) on the effectiveness of project

communications. His work is based on construction project case studies. An interesting point raised is the tendency of project participants to use informal communication systems when the ICT system is perceived to be difficult or overly time consuming to use.

Graham (2004) discusses the need for project information systems to be structured so that information flows *across* the organization as well as *up and down* the hierarchy; as it does in conventional organisations. He stresses that this cross-functional flow is at least as important to effective project communication as the hierarchical flows. Graham (2004) does not specifically address the issue of the effect of personal motivation of participants on project communications, however his focus is on building an environment in which projects can succeed. This environment takes into account project information systems, support from core team and upper management all of which would affect motivation and possibly take note of individual aspirations.

Analysis of field observations conducted during the construction phase of the projects that were observed as a part of this study showed that despite it not being company procedure, much communication took place by informal means rather than through the prescribed formal channels. This was raised as a serious concern by the interviewees during a number of the interviews. Most interviewees were against this practice of using informal information sharing and agreements, stating that it was the cause of problems relating to accountability. These interviewees had the perception that if informal channels were used to reach agreement, this agreement needed to be communicated through formal channels and that communication recorded.

2.2.4 Level of Communications Overload

Wikforss (2007) in a case study of the effectiveness of ICT tools refers to a project case study in which the high rate of information transfer that was required during the design phase of a project caused participants to revert to less cumbersome informal means of communication and largely ignore the formal channels for information transfer. As the participants had different focuses and sometimes conflicting interests, the project was negatively affected.

Dainty (2006) too identifies the need for rapid communication during the construction phase of a project, as there is a need for problems to be solved instantly, causing spontaneous, informal communication systems to arise. He cites information overload as being a frequent cause of communication failures. It seems likely that individuals will use informal communication channels when heavy flow of communications occurs due to the time pressure that will accompany such flows.

Field observations conducted for use in this research study agreed with the literature sources above. Informal (normally verbal) communications are generally quicker than formal channels. The existence of this behaviour of by-passing formal procedures was confirmed by observations on site during this study on the South African project. For example, the specified procedure for solving onsite engineering queries was by means of a written technical query. Correct procedure was for the technical query document to be handed to the relevant discipline engineer. The discipline engineer would then process the query, often with assistance from a head office discipline engineer and produce a written response. The response would then be signed off, recorded and officially delivered to and acknowledged by the contractor's site engineer. Only then could the query be acted on by the contractor. Due to time constraints this procedure was frequently ignored and informal, unrecorded onsite discussions would be held to resolve the issue immediately.

2.2.5 Amount of feedback to achieve common understanding of each communication

The literature sources referred to, highlighted the need for feedback in order to reach full understanding between parties of the information being communicated. Aucoin (2007, p. 8) found that project stakeholders paid too little attention to the "processes of communication" on a project and stresses that an understanding of overall project goals is essential to allow sense making by participants. Project management is an iterative process with a two way exchange of information directed at sense making according to him. Dainty (2006) discusses increasingly refined communications models starting with Shannon and Weaver's simple one way model through to Thompson and McHugh's model which

takes feedback, external sources and noise into account. Examples of how misunderstandings can occur when noise and feedback are not taken into account are given. He concludes that suitable media must be used to allow two way communication. Although feedback is a requisite for common understanding, it is difficult to quantify feedback. A number of iterations may be needed to achieve full understanding of an instruction. Where this is the case, the observations and interviews carried out in this study indicated that face to face discussions are the most effective means of communication. Possible exceptions to this necessity for feedback rule that are not specifically addressed by most writers are one way media such as technical specifications and drawings that are accurate and contain full details of what is required. These can be understood and acted upon by appropriately qualified project participants without the need for further discussion.

2.2.6 Degree to which communications create accountability for actions.

Dainty (2006) sees good communications as an enabler of "high performance" work teams. Because of the motivation and common goals of these teams, group accountability for outputs is created internally (Dainty, 2006, p. 37). Clearly defined responsibilities are a cornerstone of successful project delivery and consistency in communications is necessary for such team formation. These communications must identify a single point of responsibility in order to create accountability. As an example Dainty (2006) cites contractors working on Tesco (a UK retailer) projects who are required to commit to a code of conduct. They are thereby held accountable for their actions and image. Dainty (2006) does not offer insights as to rewards or sanctions that may be applied for compliance/non-compliance with commitments.

Referring to the case study of the Scottish Parliament project Dainty (2006) states that robust and effective communication structures, with clearly defined responsibilities for those involved, would have made the problems caused by lack of accountability more manageable. In the extract below he mentions evidence of informal decision-making, informality, and unclear lines of responsibility and communication as being among the causes of the problems arising in the project.

"Clearly defined responsibilities are clearly a cornerstone of successfully delivering such a complex project. The project client, client's management team, site appraisal team and all of the other players should have been clearly defined from the outset with clear reporting responsibilities and lines of communication defined for each. Ensuring consistency in the way in which the parties kept each other informed of their aspects of the work would have reduced confusion and would have ensured accountability for the problems that did arise. Without such structures, problems were left unaddressed for such a time until they could not be resolved satisfactorily. (Dainty, 2006, p. 51)

Aucoin (2007) describes the human motivation and management theories X, Y and Z and the accountability or lack thereof associated with each. McGregor's (2006) Theory X posits that people are dislike work and must therefore be controlled and threatened before they work hard enough. McGregor's (2006)Theory Y posits that physical and mental effort is natural to people and that man will direct himself if he is committed to the aims of the organization. He suggests a possible weakness of Theory Y is the possibility of a lassaiz-faire environment developing. Ouichi's (1981)Theory Z is based on mutual trust and a strong bond between organisations and employees. The accountability issue is addressed by setting objectives for individuals or groups.

The formal communication systems used would identify the single point of accountability. Aucoin (2007) however feels that participants' motivation is important in that they voluntarily accept responsibility and accountability for their actions.

Wikforss (2007) conducted a study that concludes that ICT can cause problems relating to responsibility due to the rapid rate at which changes can be communicated electronically as well as the risk of participants who have not had sufficient feedback to achieve understanding being reluctant to communicate and act.

Formal communication structures which are well enough designed will identify accountable parties. The degree of accountability in turn increases the use of formal communication channels.

2.2.7 Level of common understanding of overall project goals.

Two way communication promotes mutuality and cooperation according to Dainty (2006). He notes the importance of the type of medium used and how it will dictate whether two way communication is possible. One way communication can undermine the environment for involvement and empowerment in the organisation.

Frame (2003) states that higher levels of motivation of project participants will improve communications across professional groups and Belout (2004) asserts that the motivation of the project manager and communication with all parties are contributors to project success. Aucoin (2007) looks at this aspect from the point of view of sense making of communications and trust. He does not favour rules based approaches but advocates rather trying to achieve a rich communication style in achieving common understanding. He asserts that to achieve common understanding, it should be assumed that everybody in the team has a valuable perspective to bring to the table. It is this network of team in conjunction with customer, sponsor and stakeholders that identifies and creates the common vision of overall project goals.

These writers do not propose specific solutions to overcoming the individual agendas of project participants. This is a factor that was evident in the observations of both project teams. Individuals' performances were judged on deliverables delivered within their own area of responsibility.

2.2.8 Level of reliability of communications content

Wikforss (2007) refers to project communication networks which are designed for ideal circumstances in which all required information is available in advance and is accurate. He concedes that in practice this is not always the case. Where uncertainty of distrust exists, there are rational reasons for getting in touch directly with a trusted project member, someone who can be relied on not to look for faults and demand damages to access reliable information.

Dainty (2006) identifies the legacy of mistrust and allocating blame that are present in the construction industry and asserts that poorly managed projects will allow "competing

narratives" to persist. These "competing narratives" will negatively affect the reliability of project communications if not managed effectively. If communications are seen as not being reliable sources of information, participants' trust in communications will be negatively affected.

Aucoin (2007) emphasises trust and how important it is to promote a culture of trust. Trust would be to a large extent dependant on the reliability of communications. He gives the example of the project sponsor who, in a project review meeting, denies an earlier commitment to secure additional funding for the project. Aucoin (2007) again proposes a right brain solution: "To promote trust, the most fundamental elements an organization can help establish are common core goals and values. When individuals in a group have a common agenda and a common set of attitudes, a climate of trust will develop naturally" (Aucoin, 2007, p. 241). A factor not covered in Aucoin's (2007) proposal is the probability that different individuals may react differently to the existence of core goals. Some may not embrace these goals and feel they can do things better using their own methods especially if a previous employer had different core goals and values. This is particularly relevant to construction projects reliant on significant numbers of contract staff and where authority and accountability of the project is vested in contract staff at management levels.

The type of media used for communication can affect users' perception of its trustworthiness. According to Frame (2003) the use of two-way media will help to secure "trust, mutuality and a spirit o0f cooperation amongst members of a project team" (Frame, 2003, p. 61)

2.2.9 Level of developed usability of project's communication environment

Dainty (2006) analysed a number of factors relevant to the project communication environment. His findings are that many of the problems that develop in construction projects are a result of both the temporary and inter-disciplinary nature of project teams. This complicates an already problematic communication environment in which technical language, an adversarial culture and noise/distraction all combine to prevent

straightforward information flow from one party to another. In a project-based industry, interaction tends to be characterised by unfamiliar groups of people coming together for short periods before disbanding to work on other endeavours He argues that, those with experience of working in construction will have developed skills to cope with such a challenging communication environment. This should enable them to overcome the inherent difficulties of short-term interaction. Dainty (2006) however accepts that the nature of the communication environment will differ for each project undertaken, which places considerable demands upon the project participants who must tailor their approaches to the particular needs of the project and the teams/individuals with whom they must interact and communicate. He does not offer insights into the fact that different industry sectors and even companies within a sector use different project communication systems so even experienced personnel joining the project from other companies will have to gain experience before becoming fully functional in using their communications environment. (Dainty, 2006)

Dainty (2006) does not address the fact that unlike their more experienced counterparts, those who have little experience in working in the project environment will have to learn how to cope with the environment's challenges before they can function smoothly. This will inevitably impact on the project's performance.

Dainty (2006) discusses the role of ICT in project communication citing ICT as an efficient means of providing information and feedback. He feels it is however important to realise the limitations of ICT in engendering an effective communication environment. These limitations stem from the fact that people are the actors in organisation and only they can determine whether ICT will facilitate communication or merely compound the problems of information overload.

Regarding the user friendliness of the project communications environment, Dainty (2006) notes that contractually driven relationships, conflict and a lack of mutual respect and trust, all combine to compound what is a complex structural communication environment. He concludes that with effective communication structures in place an effective communication environment will evolve, leading to a fairer, more open and inherently more

satisfying workplace environment for all involved. His work does not cover the area of introducing newly formed project team members to the structures and the coaching, motivating and monitoring that is required for the successful roll out of the structures. Wikforss (2007), in his studies of ICT systems and its impact on project communications mentions the fact that team members did not use the systems as intended when information overload occurred. He found that the success of projects correlates strongly with the quantity and quality of communication. This implied a shift from a communications environment that was not easily usable to one that was.

Aucoin's (2007) right brain approach advocates an environment in which communications take place between team members who have made sense of the project under the umbrella of common understanding, common purpose and high levels motivation. These factors would work together to nurture a project communication environment that is easily usable. Other than placing a large portion of the responsibility for motivating the team on the project manager, Aucoin (2007) does not provide specifics on how the desired factors could be engendered in the project team.

Tushman (1980) cautions that communication environments modified to suit internal communication requirements may hinder external communications. He explores the role of gatekeepers, stating that one way of dealing with the difficulties of communicating across differentiated boundaries is through the use gatekeepers; those individuals in the communication network who are capable of understanding and translating contrasting coding schemes. He then explores the role of gatekeepers in facilitating communications with external entities. The use of gatekeepers will however slow communications as it is uses a multi-step process to transfer information and will be seen by project participants as time consuming and unwieldy.

2.3 Conclusion

The main variables discussed in the literary sources aligned with the categories that emerged as a result of the dissertation's field research. However the literature sources

discussed project communications from a theoretical and conceptual level, putting forward desirable situations that should prevail in a project without proposing methods for implementing the procedures or developing the understanding or motivation levels desired.

Some authors displayed a tendency to discuss an ideal project situation, not giving much weight to factors such as the time pressures and staffing problems that are a part of many projects, especially in the earlier stages.

Responsibility for motivation and communications in project teams was simply assigned to the project manager in a number of the sources. Even a good project manager may find his ability to achieve these attributes in his team is limited unless he was empowered to select the project team members, is backed up by suitable systems and has good back up from technical and financial departments who may not report directly to him.

Thus the literature reviewed supported the relevance for conducting this research study, and in particular for using an inductive grounded theory approach by which to increase the groundedness of conclusions reached and solutions proposed.

3 Chapter 3: Methodology and Methods

3.1 Introduction

A number of factors needed to be considered in addressing the question of which research methodology would be best suited to the research question of and the desired results of this study. The main considerations are outlined below.

3.1.1 Sources of data

I had access to construction projects and many of their personnel, therefore data could be gathered from this source – both by direct observation in the field and data obtained from interviews with or surveys using project participants. What I had to consider was how best to use this research opportunity to develop a theory of construction project communications that would provide useful insights into problems experienced within the construction project communications process; one that could be easily understood and applied to other contexts.

3.1.2 Research design

My research methodology would be influenced by the perspective/stance I adopted in terms of a philosophical approach (for example, internal realist or relativist) and epistemology (for example, constructionism, positivism etc.). In addition consideration had to be given to what perspective /stance and methodology would be best suited to the research questions I needed to answer.

Other factors that warranted consideration included how I would go about gathering data from the sources mentioned above and the fact that communication involves basic social processes (the repetitive interaction of patterns of behaviour commonly found in social life); not just procedures and systems. I needed to decide whether to use qualitative or quantitative data analysis methods, mixed methods or a combination of the two.

3.1.3 Data characteristics

"The types of data required for qualitative and for quantitative analysis have different characteristics and the techniques used for analysing them are different. Therefore when deciding on a methodology to use for researching construction project communications, my first step was to think about and try to understand what type of interactions or phenomena would be the source of data". (Walliman, 2005, p. 270).

3.1.4 Narrowing of focus

Due to the broadly defined area chosen for the study, a research method was required that would also guide the direction of the research, provide a specific area of focus and ultimately provide a theory that would identify and explain the central concept. My choice of research methodology would further be influenced by the fact that initially, the field being explored was very wide and a narrower focus was needed in order to make the study manageable and to result in a theory that was relevant and had utility. Qualitative (as compared with quantitative) research methods are exploratory and help to find the core variable to focus the research on. (Creswell, 2009)

3.2 Factors influencing my choice of research methodology

3.2.1 Field of this Research Study

Construction project communication, the field of study chosen for this research is part of the broader field of project management. The research being done thus falls into the more general category of management research.

Some examples of how the term "management" has been understood by various leading scholars are summarised in Table 3.1 below. The newer views have not necessarily replaced the older ones, indeed the views tabulated below coexist and all have some support from management thinkers today.

Table 3.1: A summary of management theory development (Easterby-Smith et al 2012, p. 5)

Views of management	Period of dominance	Key features	Types of theory
Classical	1910-1950	Functional activities	Normative
Human relations	1940-1970	Motivating people and managing change	Normative
Decision theory	1950-1970	Optimising decisions	Analytic
Work activity	1970s	What managers do	Descriptive
Competencies	1980s	Skills required for effective performance	Normative
Critical	1990s	Social construction and politics	Analytic
Process	2000s	Learning and strategizing	Analytic and normative

Management research may be used to generate developments in academic theory – (pure research) or to solve the practical problems facing businesses and their managers – (applied research). A feature of management research is that the managers authorising the research must be convinced that the research will bring sufficient benefits to make the project worthwhile (Easterby-Smith, et al. 2012).

From this exploration it became clearer that I would require a research methodology that would embrace multiple definitions of key concepts, be suitable for a study in the area of communication and be perceived as creating sufficient benefits for participants by those who would be deciding on whether to give permission for me to undertake the research.

3.2.2 Ontological considerations

Ontology refers to the philosophical approach applied to the analysing of a problem and is described as being “about the nature of reality and existence”. (Easterby-Smith, 2012, p. 17) Table 3.2 below lays out brief descriptions of four of the ontologies that are often applied to scientific enquiry.

Table 3.2 Four ontological perspectives (Easterby-Smith, 2012, p. 17)

Ontology	Realism	Internal realism	Relativism	Nominalism
Truth	Single truth	Truth exists but is obscure	There are many truths	There is no truth
Facts	Facts exist and can be revealed	Facts are concrete but cannot be accessed directly	Facts depend on viewpoint of observer	Facts are human creations

As the research on construction project communications will depend heavily on the perceptions of observer and subject alike, a relativist approach is indicated.

3.2.3 Epistemological considerations

Epistemology is the philosophical approach to how researchers can know the nature of the physical and social worlds. Two of the major views in epistemology are positivism and social constructionism (Easterby-Smith et al. 2012). Easterby-Smith et al (2012) describes the contrast between these positions as:

1. Positivism "The social world exists externally and its properties should be measured through objective means rather than being inferred subjectively through sensation, reflection or intuition." (p. 22) and
2. Social Constructionism "Reality is not objective and exterior, but is socially constructed and given meaning by people. The focus is on the ways in which people make sense of the world especially through sharing their experiences with others via the meaning of language." (p. 23)

Communication involves sending, receiving and decoding of a message. Whether it is done by the written word or verbal means in the work setting, this involves basic social processes (Fernandez, Using the Glaserian Approach in Grounded Studies of Emerging Business Practices, 2004). These processes could not be set up for study in an artificial experimental

setting and objectively measured. The research could thus not be conducted using the classic positivist scientific method of developing a hypothesis, subjecting it to experimental testing and measuring the result. Thus a positivist philosophy with its requirement for an inflexible, artificial approach and production of possibly less insightful conclusions was not deemed appropriate to this research.

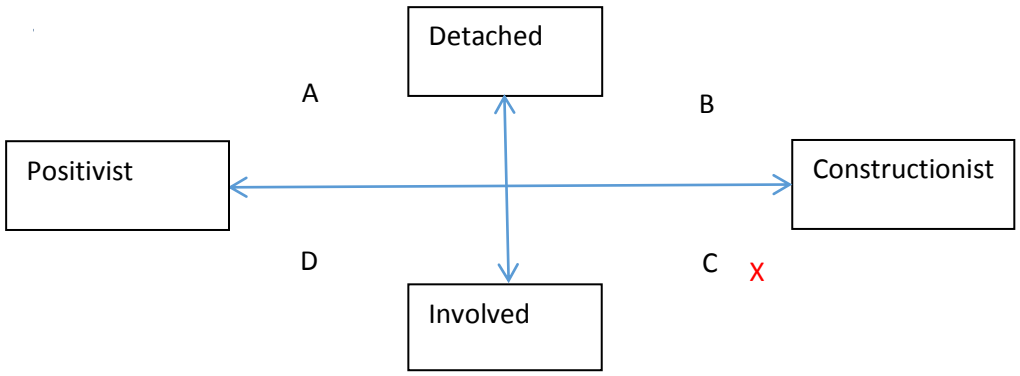
Researching construction project communications would require the observation of events in their natural setting in order to form a clear picture of what was going on and the use of a process that facilitates the understanding of the concepts being studied. These concepts could then be grouped, analysed and conclusions drawn. A theory of construction project communications could be developed from these conclusions accepting that data came from multiple sources. This pointed toward using an approach compatible with a social constructionist epistemology, and using a research method suitable for collecting, processing and analysing qualitative data.

3.2.4 Quantitative and qualitative methods

Methods for data processing and analysis used in management research can be either quantitative or qualitative or a combination of the two. The emphasis has moved back and forth between quantitative and qualitative in recent decades. More recently acceptance that both methods may be needed in order to research some management issues. The different methods also require greater or lesser researcher involvement with the research subjects.

Figure 3.3 below depicts how a research method is positioned with respect to the epistemologies, with constructionism (aligned with qualitative methods) and positivist (aligned with quantitative methods). The distinctions in the degree of involvement of the researches with the subject(s) being studied is also depicted. (Easterby-Smith et al 2012, pp. 1, 39)

Figure 3.3 Interplay between epistemology, research method and data type



3.3 Research methodologies considered

The research to be conducted was aimed at producing knowledge that could be used for the solution of a perceived practical problem. My sources of data for the research would come from direct engagement with and observations of project participants in a work situation. Project participants came from many disciplines and skill levels and an approach that cut across these divisions was essential. Data would include their views and how they handled various social transactions.

Before research process started, it was uncertain how the research study would unfold. Initial data and analysis would guide the ongoing research, so a research methodology that was flexible was necessary.

For the above reasons a mode 2 research model was indicated.

Figure 3.4Characteristics of mode 2 research

Source: (MacLean D, 2012)

Characteristics of Mode 2 research.

Knowledge produced in the context of application	Knowledge is generated around a particular application. Linked to a perceived problem Aims to be useful
Transdisciplinarity	Sets out to solve transdisciplinary problems by the integration of different skills in an action framework.
Heterogenity and organisational diversity	Transitory, multi faceted problems require heterogeneous teams whose members come and go as the situation unfolds.
Social accountability and reflexivity	Greater interest and involvement in research outcomes drive communication transparancy, inclusion and governance levels.
Diverse range of quality controls	More participants involved in the research cause quality issues to be examined from multiple perspectives.

Some of the Mode 2 research methodologies considered for the purpose of this research included:

- Grounded Theory. The discovery of a core variable is the goal of grounded theory. "The researcher undertakes the quest for this essential element of the theory, which illuminates the main theme of the actors in the setting, and explicates what is going on in the data" (Glaser, 1978, p. 94). Grounded theory achieves this "discovery" by means of the constant comparison of data gathered from the field of study and the classifying of these data into categories. Categories are compared to identify the core category. Grounded theory is particularly suitable for studying broadly defined research fields as it narrows the focus of research down to one or two core categories. (Mills, 2006, pp. 30, 31)

Grounded Theory appeared suitable for this study.

- Action research. Data is gathered from observation of phenomena, the researcher is part of the group being observed, and cannot help but influence its behaviour. An argument for using Action Research is the fact that "researchers are involved with things that really matter to them provides a richness of insight that could not be gained in other ways." (Eden, 1996, p. 775)

  The drawbacks of this method for researching construction project communications include; lack of repeatability, and that when using Action Research, matters are best studied by introducing changes and observing outcomes. (Baskerville, 1999, p. 4)

  The construction project being studied was a very large one, subject to rules and procedures which I could not change, and I wanted future researchers to be able to repeat the study in other projects. Action Research was rejected as a research methodology.
- Phenomenology. One definition of phenomenology is: "The name for a philosophical movement whose primary objective is the direct investigation and description of phenomena as directly experienced, without theories about their causal explanation and as free as possible from unexamined preconceptions and presuppositions." (Spiegelberg, 1975). There are a number of methodologies described which can be used for this type of research but although in some ways phenomenology is similar to grounded theory it does not allow a theory to emerge from data, but rather from the researcher's interpretation of the observations. Phenomenology relies on the participant's own account of his/her experiences. Phenomenology is also described as exploring the "essence" of human experiences involving a phenomenon, as described by the study's participants. (Creswell, 2009, p. 17) It also lacks the characteristic that grounded theory has of focusing on a core area; thus narrowing down a wide and loosely defined research topic. For these reasons Phenomenology was deemed to be less suitable than Grounded Theory for the purpose of this research.

I selected Grounded Theory as my research method due to its ability to make the research problem and its delimitation start to emerge from the open coding once the interviews and

observations start. The research problem will become clearly defined and structured as the coding, collection and analysing gets under way. A core variable (perhaps more than one) will emerge, and saturation occurs – further data adds nothing to the core variable. This ability of grounded theory to focus the research on a core variable was particularly suited to my research, as I had identified a very wide area to research namely Construction project communications (Glaser, 1992).

Because of the high degree of researcher involvement and the many perspectives of members of the projects being studied, the methodology would be positioned at X on figure 1 above.

3.4 Grounded Theory – the methodology of choice for this research study

3.4.1 A brief history of Grounded Theory

Grounded Theory is a research methodology that was developed by Barney G Glaser and Anshelm L. Strauss in the 1960s. The methodology, initially known as the Constant Comparative Method was developed to help researchers doing qualitative analysis of data, regardless of which epistemology the research was located in. The Grounded Theory method addresses the problem facing these researchers – pulling the analysis of collected data into 'a concise theoretical formulation based on the data under the area of study' (Glaser, 1992, p. 8). Their first book Discovery of Grounded Theory was published in 1967. In 1987 Strauss and Corbin published Qualitative Analysis and other books. Some parts of the methodologies in these publications differed from the original grounded theory concepts. This caused a public disagreement between the two academics, which resulted in the Grounded Theory research method being further developed along different lines and by two schools. Each school was lead by one of the original partners and today distinctions can be drawn between the Grounded Theory method continued and refined by Glaser and Grounded theory methodology as developed by Strauss and Corbin.

3.4.2 Grounded Theory Methodology – 2 schools

After the split, Glaser continued to develop and refine the work that he and his partner,

Strauss had begun. Strauss joined forces with and their work gave rise to a second school, namely Strauss and Corbin's Grounded Theory Methodology.

According to Glaser (1992), the method as developed by Strauss and himself and later refined by Glaser does not allow for preconception. Rather it relies on the emergence of theory from the data. In contrast he viewed Strauss and Corbin's method as relying on "preconceived conceptual description" (Glaser, 1992, p. 9)

Strauss and Corbin did not see their methodology in the same light and held the view that "A researcher does not begin a project with a preconceived theory in mind (unless his or her purpose is to elaborate and extend an existing theory). Rather, the researcher begins with an area of study and allows the theory to emerge from the data." (Strauss, 1998, p. 12)
The major differences between the two schools of Grounded Theory relate mainly to the coding paradigms each adopts. The crux of the dichotomy is that Strauss, as he analyses the data stops at each word to ask 'What if?' Glaser maintains attention on the data and asks, 'What do we have here?' (Morse, 1994, p. 220)

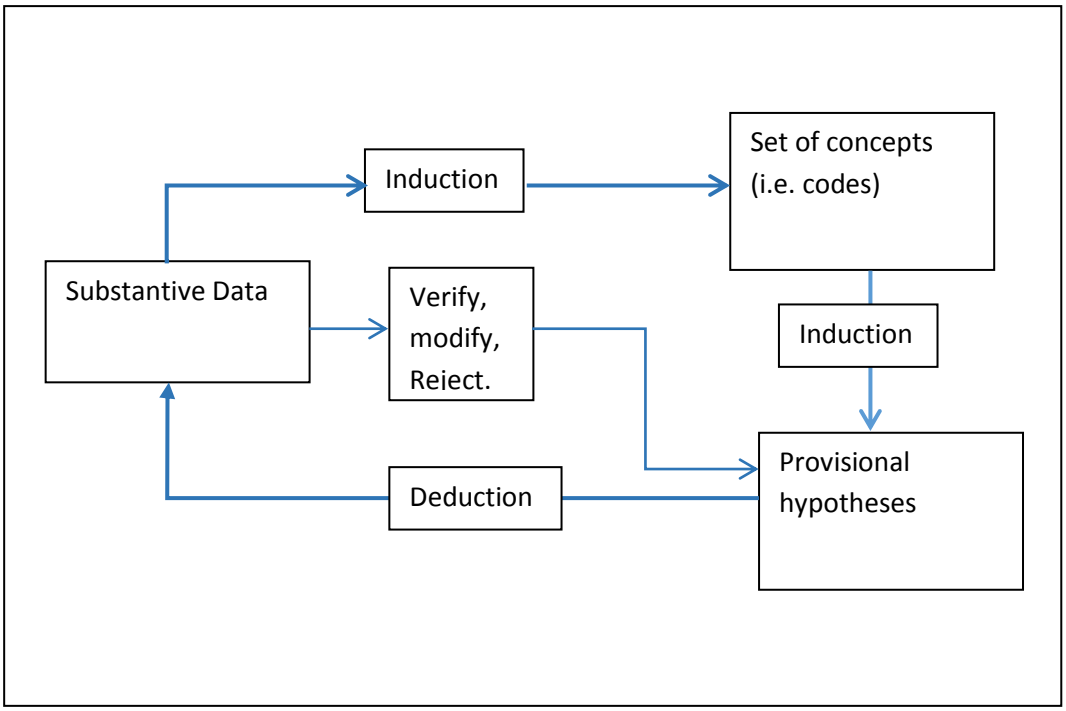
3.4.3 A description of the Grounded Theory Methodology

In reviewing the literature during the early parts of the study care was to be taken to be sensitive to all evidence discovered in literature, whether it seemed to confirm or disconfirm the emerging theory. This aligns with Glaser's method of ignoring the literature about theory and fact on the area under study, in order to ensure that the emergence of categories will not be affected by concepts that would not emerge from the application of grounded theory.

Later in the study when the interviews and observations were completed and data analysis was at an advanced stage during sorting and writing up, the literature in the substantive area was used as additional data on the basis that "All is data". (Glaser, 1967, pp. 37, 40)

(Martin, 1985) defines the Grounded Theory Methodology as an "inductive theory of discovery methodology that allows the researcher to develop a theoretical account of the general features of the topic while simultaneously grounding the account in empirical observations of data". (Martin, 1985, p. 141) The process of theoretical sampling (see later) can be deductive if the researcher develops a hypothesis by conjecture and then researches the field to seek confirming evidence.

Figure 3.5 The inductive-deductive cycle of the grounded theory method (Fernandez, Using the Glaserian Approach in Grounded Studies of Emerging Business Practices, 2004, p. 90)



3.4.4 Key canons of Grounded Theory

Fernandez (2005, pp. 44, 45) provided the following summaries of some key terms used in the Grounded Theory Methodology

- Theoretical sampling – the data collection process that takes place from beginning to end of the research.
- Open coding – analyse and categorise the data collected and find properties of the categories. Try to understand what the concept under discussion is.
- Theoretical memos – theorising write-up about why the things being observed (codes) are happening. Capture the thoughts of the researcher as he goes through his work.
- Selective coding – limit the theory to one or two core variables, which can then guide further data collection and analysis.

The first step in a Grounded Theory Methodology research project is to 'enter the field'. This will include finalising the research question, and carefully choosing the cases to study such that they are relevant to the question as well as giving a broad enough view of the phenomenon being researched. Ethical considerations must also be addressed. (Baskerville, 1999, p. 85)

The problem is then 'discovered' from participants' accounts and from observations. This requires that the researcher make sure the sources of data are accessible.

Start with your **theoretical sampling**. This will continue until the end of the research and provides the data which allows themes to emerge.

As the data flows in from the observations/interviews and other sources, **open coding** is used to produce categories and their properties.

The researcher's understanding of the relationships improves as open coding proceeds. **Selective coding** can now begin and characteristics will be identified and merged together. As this process progresses, the researcher will begin to **selectively code** for a core category (which he has identified). Once this core category has been identified, only variables that relate to the core category will be used. Theoretical sampling and theoretical memos are aimed at exploring aspects of the core category.

Theoretical memos are used at the same time as open coding. They contain the researcher's ideas about the codes and their interrelationships. The researcher uses theoretical memos throughout the research right through to the end to capture his/her

thoughts. They raise the theoretical level via a “continuous process of comparison and conceptualisation.” They also provide freedom, flexibility and enhance creativity. (Fernandez, 2005, p. 50)

Grounded Theory Method allows researchers to deal effectively with the important issues of bias and preconceptions, and provides a systematic approach that takes into consideration extant theory but is not driven by it. Also triangulation is embedded in the methodology, which facilitates achieving conceptualisations based in multiple perspectives and data sources. (Fernandez, 2004, p. 83)

3.4.5 What distinguishes Grounded Theory Methodology from other qualitative methodologies

At the heart of Grounded Theory is conceptualisation. Conceptualisation should not be confused with the simple description of an event as witnessed. In a Grounded Theory sense a concept is a basic social process (BSP) that is occuring in the field of study and naming it. The BSP’s are deduced from observed incidents.

Concepts emerge from the gathered data when incidents with conceptually similar causes are grouped. The concepts are then grouped into categories by virtue of their properties. This grouping (sorting) is achieved by bthe emergence that comes about as a result of Grounded Theory’s constant comparitive method.
Other qualitative analysis methods do not use the constant comparative method to develop concepts, but rely rather on description of events by participants in the study (their perception). The participants’ perception must therefore be relied upon.

3.5 Suitability for and application of Grounded Theory Methodology in this research study

Grounded Theory Methodology has been widely accepted as a research methodology suitable for studying social phenomena. It is also being used extensively for research in the

field of management practice. The methodology explores the richness and diversity of the human experience and can contribute to the development of middle-range theories in management. (Fernandez, 2004, pp. 83, 84)

In the following chapter, chapter 4, a description of how the chosen research method was applied to this study of project communications is provided.

3.6 Ethics

The Engineering and Built Environment Faculty: Assessment of Ethics in Research Projects form was completed and accepted by U.C.T. The following initial questions were addressed:

- Is there a possibility that your research could cause harm to a third party?
- Is your research making use of human subjects as sources of data?
- Does your research involve the participation of or provision of services to communities?
- If your research is sponsored, is there potential for conflicts of interest?

The only positive answer was to the second of the above questions. Due to the positive answer, a questionaire addressing concerns relating to the ethics relating to human subjects had to be addressed. A copy of the complete questionaire is included in Appendix 12.

Data would be gathered from project participants by means of interviews and observations of events that occurred during the commission of their duties. All interviewees were informed about the purpose of the interview beforehand and granted interviews of their own free will. No confidential information which could be linked to employers or other companies or groupings was solicited or disclosed. As an additional measure to ensure ethical research, each data gathering and analysis action was carried out in the light of Velasquez's four questions in the approach to business ethics. (Ryan, 2009, p. 21)

Table 3.3 Velasquez' questions on business ethics

Is the action consistent with the moral rights of those whom it will affect?	All interviewees were made aware of the purpose of the research and how the data from the interview would be used. Observations were made in public areas during the routine commission of the observed parties' work duties. There seems to be no negative effect on moral rights of stakeholders by making project communication more effective. Indeed stakeholders will have access to better quality information which they may use to uphold their moral rights.
Will the action lead to a just distribution of benefits and burdens?	Effective communication in a project should have the effect of improving efficiency, thus reducing costs for the same benefits. The financial burden on the project owner will be reduced. This could benefit could have a knock – on effect to employees, customers and even the community in general
Does the action exhibit appropriate care for the wellbeing of those who are closely related to or dependent on oneself?	Not applicable

3.7 Conclusion

Having selected grounded theory as a suitable research methodology and having immediate access to a field from which to gather data, I was now in a position to apply the methodology. The description of the application of the methodology is described in chapter 4 which follows.

4 Chapter 4: Application of Methodology.

4.1 Introduction.

In this chapter the application of Glaserian Grounded Theory research method to this research is described. The field work sites, the sampling decisions, data collection and analysis are discussed.

4.2 Fieldwork sites

The first fieldwork site from which data was gathered from was from the construction site of a very large petrochemical project in South Africa between August 2011 and June 2012. I was employed by the E.P.C.M. (engineering, procurement and construction management) contractor and had unrestricted access to the site during the construction phase of the project. At its peak, the number of combined contractor and management staff on site was around two thousand, five hundred people. Many of the contractor's senior site staff were highly qualified and experienced project management practitioners, as were many of the client staff (see Table 4.1 below giving details of staff members that were interviewed during both studies).

The E.P.C.M. contractor is the local subsidiary of a major United States based engineering and construction management company (established in 1927). The project was executed according to their well tested project execution procedures. The construction phase of the project ran reasonably smoothly and was on course to be delivered on time and within budget at the time of the study.

A second fieldwork site used as a source of data was a somewhat smaller power generation project I managed in Saudi Arabia; also during the construction phase. The total number of project participants at the peak of the project was about eighty.

My role was that of project director for the company and again I had free access to all of the project participants.

This project differed in some respects from the first one. Skills levels of site and management staff on the Saudi project appeared to be very much lower than they were on the South African project. The site workforce was made up mainly of migrant workers from India, Philippines, Pakistan and Bangladesh. These workers often appeared to have had little or no formal training in the work they were doing. Engineering and management staff included Americans, a South African, Jordanians, Lebanese and Saudis. Most of the management and engineering staff on the Saudi project were inexperienced in project execution.

4.3 Data collection, processing and analysis

The use of a survey by means of, for example a questionnaire to be filled in and returned was deemed unlikely to succeed as the likelihood of receiving a response from busy project staff was low. Contacting and managing the feedback from a large enough sample to be representative of the whole project was not feasible in the time available. Considering this and in view of the type of data to be collected (descriptions of social processes) interviews and observations were considered to be the most suitable sources of data for the study.

Further reasons for choosing Interviews and observations as the most suitable methods of data collection for this study were due to the store of project knowledge within the project staff's memories as well as the abundant opportunities for observing actual events and behaviours on site. The choices of data collection methods aligns with Walliman (2005) recommendation, namely "The reasons for choosing particular data collection and analysis methods are always determined by the nature of what you want to find out and the particular characteristics of your research problem and specific sources of information" (Walliman, 2005, p. 270)

4.3.1 Sampling

Sample selection for the collection of data was an important factor in guaranteeing the reliability of the research data gathered. This is supported by Coyne (1997) who states that "In qualitative research, sample selection has a profound effect on the ultimate quality of the research." (Coyne, 1997, p. 623)

The sample choices for the study were guided by Glaserian grounded theory. Grounded theory had a focusing effect on sample selection as data were constantly compared with emerging theory. A fundamental of Glaserian grounded theory is that the emergent theory will guide the researcher as to what information is to be sought next and thus who to go to for it. (Glaser, 1967)

This meant that as interviews were to be conducted (rather than a survey), sample size would be small and who should be included in the sample would be guided by the focus provided by the emerging theory. In other words, the people most likely to be able to answer the type of interview questions being put would be identified and interviewed i.e. purposive sampling.

The first step however was to decide where to start for the first round of interviews with no emerging theory to point at suitable interviewees Senior project staff was interviewed to gather initial data as they held a vast store of experience and knowledge relating to the research question. It was also felt that it was likely that these people could direct the research toward areas that were relevant to the study. This is in line with (Glaser, 1967) where he acknowledges that in the initial stages of a study, researchers will "go to the groups which they believe will maximise the possibilities of obtaining data and leads for more data on their question. They will also begin by talking to the most knowledgeable people to get a line on relevancies and leads to track down more data and where and how to locate oneself for a rich supply of data." (Glaser, 1978, p. 45)

After this initial choice of data sources, theoretical sampling provided data for constant comparative analysis and the direction and sources of data collection were controlled by the theory that emerged. (Glaser, 1978)

4.3.2 Data from interviews

New perspectives were being sought on the subject of project communication. It was therefore decided to conduct semi-structured interviews, with the same questions being put to each of the interviewees (see Appendix 2). The questions were open ended so that interviewees would be able to express opinions rather than giving simple yes/no answers. This is in line with Walliman's (2005) view:

"The structuring of the interview depends on the type of information you want to elicit. For very precise answers to very precise questions, used for quantitative and statistical analysis, a tightly structured interview is required with closed questions formulated in a method similar to a questionnaire. At the other extreme, if you need to explore a situation and wish to get information which you cannot predict, a very unstructured form of interview is appropriate. A semi structured interview falls in between the two, achieving defined answers to defined questions, while leaving time for the development of these answers, and including more open ended questions." (Walliman, 2005, p. 285)

Additional questions were put to interviewees to clarify points if necessary and if discussion deviated from the original question's answer, this would be allowed or even encouraged.

In each of the two projects studied, the first round of interviews with senior project staff provided a starting point with data to be analysed and categorised. Fixed time appointments of 60 minutes each were made allowing sufficient uninterrupted time with the interviewee to allow full, unpressured responses to the questions and discussions on additional points as appropriate.

To ensure a variety of viewpoints in the interviews, interviewees from different disciplines at varying levels of experience and seniority from both the contractor and client sides were selected. Table 4.1 below shows details of the selection.

The same questions were asked of each of the twelve interviewees, however, sometimes supplementary questions were asked to gain a fuller answer or clarify a point. Interviewees understood the questions, as they were all project staff, and understood the situations referred to and jargon used. The questions were designed to be neutral – i.e. not to influence the interviewees' answers. Conducting the interviews, a neutral stance was maintained, neither agreeing nor disagreeing with comments and assertions made by the interviewee.

Interestingly, most interviewees were a little reticent about being interviewed, but after the introduction and first question all gave very full answers, in most cases referring to specific experiences they had had to support their claims.

A second set of interview questions was developed that focused on the core category. Interviews were conducted using project stakeholders from the Saudi Project.

The data from these interviews were used in conjunction with data from observations and literary sources to develop a theory of project communication using the methods described above. The data analysis process is explained in the following section.

Table 4.1. Details of staff interviewed.

Int. no.	Current Job Title	Approximate years' experience.
1	Site manager (FWSA)	48 (various positions)
2	Project Facilities Manager (FWSA)	48 (various positions)
3	Area Construction Manager (FWSA)	23 (various positions)
4	Head Planner (FWSA)	11 (various positions)
5	Planner (FWSA)	6 (various positions)
6	Project Q.C. Manager (FWSA)	45 (various positions)
7	Project Director (FWSA)	28 (various positions)
8	Sastech Project Engineer	28 (various positions)
9	KRT Project Manager	18 (various positions)
10	KRT General Manager – services	6 (various positions)
11	Source Energy Project Manager	8 (various positions)
12	Source Energy Chief Operating Officer	31 (various positions)

4.3.3 Data from observations

Observations were made of thirty separate events on the South African construction project. The observations were of events that occurred over a period of about three months, in different areas of the construction site and in the EPCM contractor's and client's offices. The events involved many different individuals, rather than the same individuals time after time. Reasons for the event occurring were deduced after analysis. Some analyses were conducted by me only, but a number were also conducted by project team members such as site managers or safety officers (for example, investigations into the root causes of safety related incidents). These findings were used to help develop my own analysis of the reasons for the event's occurrence.

A journal listing significant events was kept. The pages were divided into two columns. The left hand column entry briefly described the event as objectively as possible, with no interpretation offered. On the right was an analysis of why the event occurred. See example in table 4.2 below:

Observations were recorded and compared with categories that were emerging from the interviews; new categories were created where there was not good fit with existing categories.

The projects being studied provided a rich source of construction project communication related events to observe and analyse. Observations of events that occurred around me in the course of the project's execution could be used to test the validity of the answers to interview questions.

Table 4.2 Cable Trench Flooding

	Event	Interpretation of Reasons.
16 15/09	The open cable trench to the lights at the north side of the Arge Reactors was flooded by client's operations for the fourth time in as many weeks. Backfill was washed away and the cables displaced.	According to client Project Management, the Operations Dept. was aware of the problems caused by this discharge from their plant, but was not prepared to do anything about it. Further investigation revealed that Sasol Operations could not easily do anything about the discharge, which occurred automatically every week or so. Contributing to the problem, a drain was partially blocked causing the wash water to flood across a concrete slab and into the trench. Operations did not seem to be aware of the seriousness of the consequences of this event. Both Operations and Projects Dept. were unaware of the blocked drain. Once each party understood the other's problems, the problem was solved by having the drain cleared by Maintenance Dept. and protecting the trench with a dyke. A lack of understanding by each stakeholder of the other's problems was the root cause of the event.

4.3.4 Data from literature review

Research to find additional data that could be used in developing the theory of effective construction project communications was done as the research progressed. Sources of data included academic books and scholarly articles. These were sourced from the University of Cape Town and other libraries as well as from the internet.

These secondary data were used to add to the field data collected. The content to be used was written up as notes and indexed to facilitate traceability. As the nature of large construction projects is changing, only fairly recent books and articles were used.

Some aspects of construction project communications that have undergone considerable change in recent years are:

- Advances in the field of information and communication technologies (I.C.T.). I.C.T. has the potential to positively impact the way in which construction project information is managed. In order to take advantage of this, project organizations need to structure accordingly and try to adjust the attitude of employees to the new technologies. (Dainty, 2006, p. 213)
- Many construction projects are increasingly carried out in a multi-lingual and cultural environment. The management of communications with disparate groups requires new skills and systems to be present (Dainty, 2006, p. 225).
- Communication between specialists. The modern construction project environment includes inputs from specialists whose jargon may differ from one discipline to another. The successful planning and execution of projects depends on their being able to send and receive communications that are mutually understood. (Dainty, 2006, p. 109)

For the above reasons it was felt that older sources may be outdated, and project related literature written after about 1990 was favoured.

Although disconfirming evidence was sought by means of further interviews, observations and reference to existing literature on the subject, good correlation between the data extracted from these literary sources and the findings of the field research was found to exist.

4.4 Theory building process

The data collected from the above sources was processed by the constant comparison method to produce a grounded theory. The object of this process was to develop a theory which would account for the behaviour of project participants. (Glaser, 1967)

Transcripts of the interviews were thoroughly reviewed, observations were carefully scanned and concepts identified on a "what is going on" basis to identify social concepts – how were people perceiving and handling situations. (Glaser, 2002, p. 32)

The first round consisted of sorting data into categories (open coding) and subjecting codes and categories to comparisons with one another. See appendix 3 for the codes developed and the highlighted sentences/phrases in the interview transcripts that gave rise to the categories.

As open coding continued, variables were compared with one another, each against the background of Glaser's three key questions:

- What is this data a study of?
- What category or property does the incident indicate?
- What is the basic process that "processes the main problem that makes life viable in the action scene?"

(Glaser, 1992, p. 51)

By comparing codes with each other, categories started to emerge. Constant comparison continued of code with code and code with the emerging categories and similar variables were grouped together under suitable titles or categories until saturation was achieved. See Appendix 4 for full details.

Throughout data collection and processing, theoretical memos were used to help conceptualise the relationships between categories and to develop sub-categories of the codes. Categories identified from the open coding process were grouped with the aid of the theoretical memos and a core category was identified after a number of iterations. These initial groups were further analysed using theoretical memos and the largely descriptive codes were taken to a higher level of abstraction. Some categories were merged when viewed from the higher level of abstraction.

Theoretical coding then provided a conceptual model of how the final set of codes related to one another and the resulting theory of effective project communications was the end product. The theoretical codes were then grouped to find a core category. A core category that most other categories related to was identified. Sub categories of the core category were identified and their interactions with the core category formed the basis of my theory of effective construction project communications. This started to focus the research on the core category.

The core category was used as a basis for selective coding – only variables that related to that category were encoded.

With a core category identified, selective coding – coding that confines itself to "only those variables that relate to the core category in sufficiently significant ways to be used in a parsimonious theory" (Glaser, 1978, p. 61) was conducted. A final set of variables emerged from a second round of interviews and observations that related to the core variable.

Additional research (literary sources and further observations) seeking disconfirming evidence did not produce a result contrary to the preliminary theory. Nor were any additional categories identified. (See Appendix 5 and 6 for full details.)

4.5 Trustworthiness of Data

4.5.1 Reliability of data sources

- Interviews - Interviews were conducted with project staff at levels varying from very senior (and experienced) to junior. Themes were identified and correlation between the various interviewees' responses was looked at and found to be good. Interview questions related directly to project communications and answers drew on interviewees' experience relating to project communications.
- Observations - My two sets of observations were conducted over a substantial period of time (about nine months in the case of the South African project and thirteen months in the case of the Saudi project) so staff and other stakeholders being observed were used to my presence. The observations were of naturally occurring activities and interactions in the life of a construction project, rather than of ones manufactured for the purposes of this research study.
- Literary sources. Books and articles consulted were peer reviewed and scholarly in nature and by respected authors in the field studied. Literature was given the same status as data collected by interview and observation. (Dick, 2005, p. 9)

4.5.2 Triangulation

Due to the constant comparative method employed in the Grounded Theory research method, data is subjected to triangulation.
The multiple sources of data and their triangulation help to ensure the credibility of the data. (Glaser, 1967)

4.5.3 Disconfirming evidence

The above sources were examined for data or categories that may disconfirm the data collected. None was found.

4.6 Summary

Fieldwork was carried out on construction project sites in South Africa and Saudi Arabia. Data gathered from interviews and observations was processed using the constant comparative method to produce codes, then a further iteration created categories from which a core category was identified. Sub-categories of this category were identified and their inter-relationship formed the basis of my theory.

The research was examined to confirm trustworthiness and that ethical standards had been upheld and found to be satisfactory.

In the following chapter, chapter 5 the theory building methods explained with reference to some of the tools and techniques used and the findings presented.

5 Chapter 5: Findings.

5.1 Introduction

In this chapter the findings that emerged from the processing and analysis of the data collected during the fieldwork stage of this research are presented. These findings were synthesised to develop a preliminary theory which is presented as a visual display in (Fig 5.1). The core category, the one which most needs to be present in a construction project environment for effective communication to take place – was found to be "developed usability of project communications environment". This core category was used was used to develop the final theory of effective construction project communications. (Glaser, 1967)

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5.2 Illustration of theory building process

A description of the steps in the process used to build the theory are set out below.

5.2.1 Coding and grouping of concepts

Data sources – interviews

A portion of one of the interview transcripts is inserted below. The sentences/phrases in the interviewee's narrative that indicate a variable are highlighted and these are grouped as concepts are identified.

Interview Malcolm 02/11:

Q1, part 2: I've worked on a number of projects that've gone well and I've worked on a few that haven't gone too well that could be improved. When you talk about communications that is really,.....uh.... .it covers a wide spectrum..... I think that communications is a

crucial element actually in terms of any successful project would not be able to succeed unless the communications are good between all parties. The reason why you get a breakdown in communications is usually a self interest of people involved in their own elements of the project. That tends to be the reason I've found. You could put it down to personality conflicts but some people don't want to communicate in those emails A lot of times you're insulting people's intelligence in sending them an email that is not particularly significant. It is sent with the intent of highlighting a point so I don't have to do any more or I've covered my backside.

It's the same with meetings – meetings are another form of communication; but if you work on these sort of projects you can't take all those emails and meeting minutes and take them out on the job and then building the plant from those minutes and emails so it's only when those emails and minutes are transferred into effective docs that can be used and has been checked and can be used to build that plant. If you've got that information, you don't need all those emails and faxes to build that plant. When I was working for BOC we didn't have all those emails and computers we didn't have those things. But basically you would get a set of drawings, which is also engineering communication, that were done by draftsmen on a drawing board. ***C4*** *They'd have a chief draftsman looking over their shoulders to make sure they were doing the right thing you know the detailing and so on. But then when they were sent to site you had a halfway decent set of drawings. These days that doesn't happen.*

Each of the above highlighted concepts above was grouped according to my understanding of what social process was being described and listed. For example; the partial sentence marked C4 in the above transcript fell under the variable concept **C4** (Level of effectiveness of supervision of team members) in the table below. This was done for all interviews and observations and other statements from interviews or observations that fell into this category were grouped under it.

Below is a part of the list of initial variables identified from the data. The complete list can be found in Appendix 4.

Figure 5.1 Extract from open codes table

Open Codes	
C1: Level of self-interest of individuals interfering with communication outcome	**C2: Quality level of content of communication.**
C3: Level to which communication is translated into usable form.	**C4: Level of effectiveness of supervision of team members.**
C5: Amount of information communicated between different parts of team.	**C6: Appropriateness of communication medium.**

Data sources – observations

An example of a field observation can be seen below together with its open coding on the categories in the list extract above.

Observation: Quarrel between planner and site manager about the construction schedule that had been signed off without consulting the site manager. The planner was re-deployed to Head Office.

Cause of incident: Lack of communication with all stakeholders.

Open code group (Figure 5.1 above): C5: Amount of information communicated between different parts of team.

Field observations are included in Appendix 10.

Second round of coding

A second round of grouping of variables was then carried out. Each of variables tabulated above was written on a separate sheet of paper and variables were compared and grouped from a higher level of abstraction.

Figure 5.2 below shows the outcome of the process.

5.3 Theory building

In the theoretical coding stage, each of the categories (written as variables) was considered for its influence on the others. The variables that most influenced others were considered to be drivers in the communication process. This result assists in the identification of the core variable. The comparison is depicted below as an interrelationship digraph with arrows showing the direction of influence.

Figure 5.2: Emergent categories after second round of process

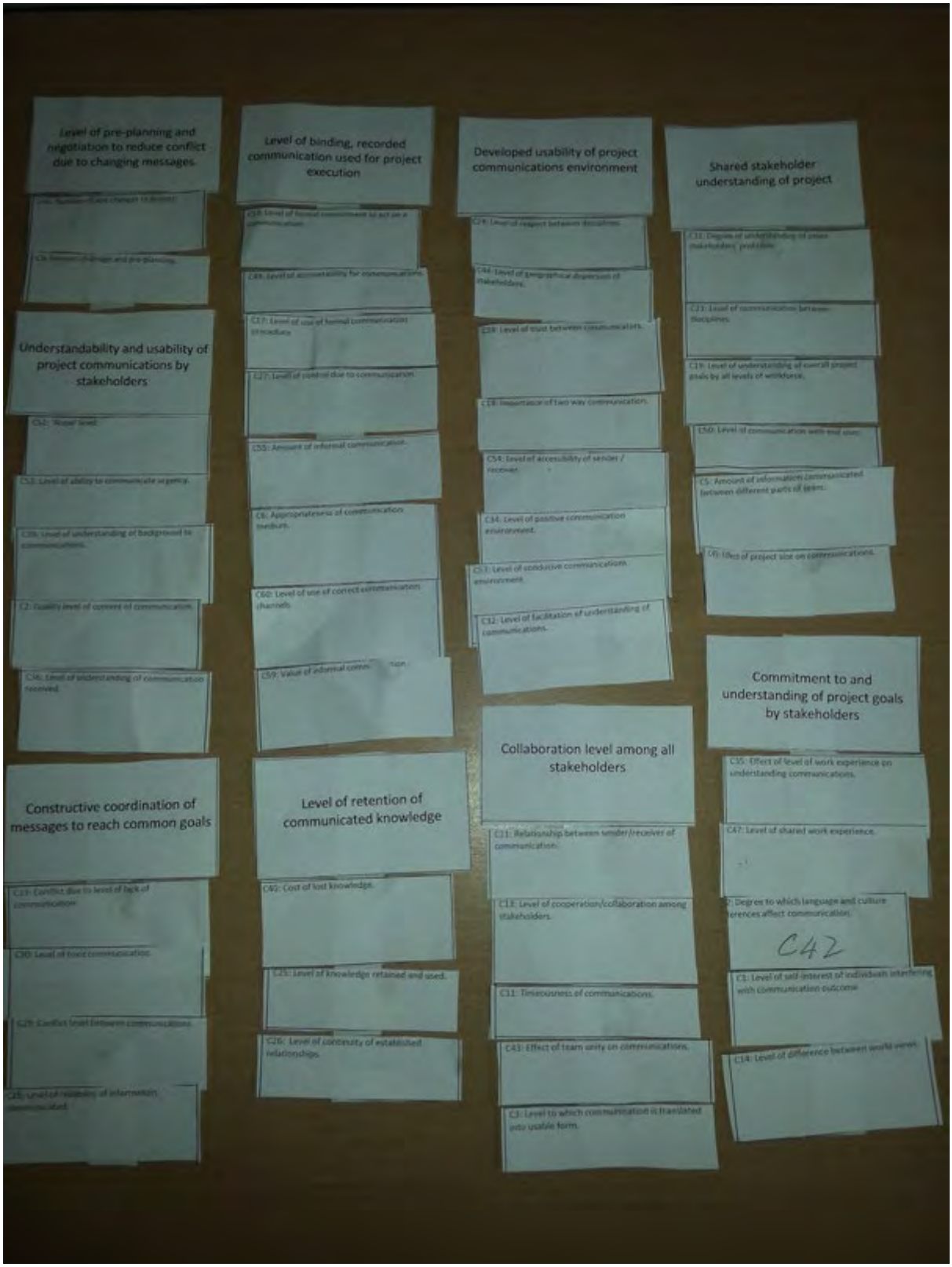
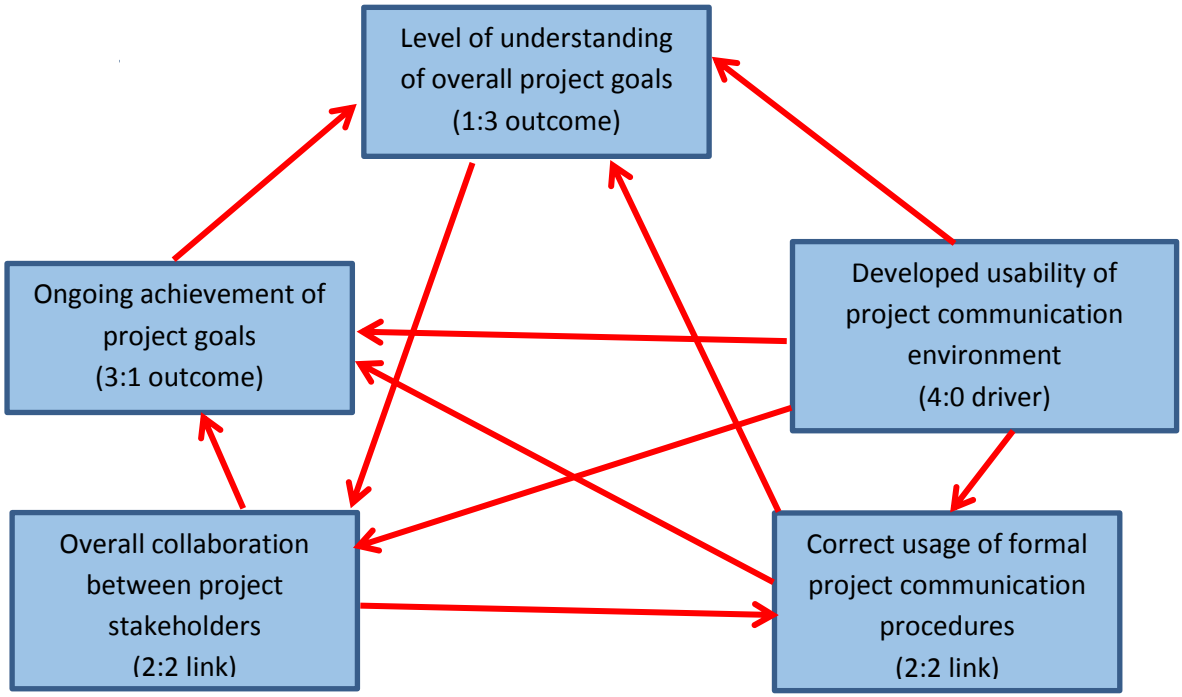

Level of pre-planning and negotiation to reduce conflict due to changing messages
Level of binding, recorded communication used for project execution
Developed usability of project communications environment
Shared stakeholder understanding of project
Understandability and usability of project communications by stakeholders
C52: Noise level.
C53: Level of ability to communicate urgency.
C2: Quality level of content of communication.
Commitment to and understanding of project goals by stakeholders
Collaboration level among all stakeholders
Constructive coordination of messages to reach common goals
Level of retention of communicated knowledge
C42
C1: Level of self-interest of individuals interfering with communication outcome.

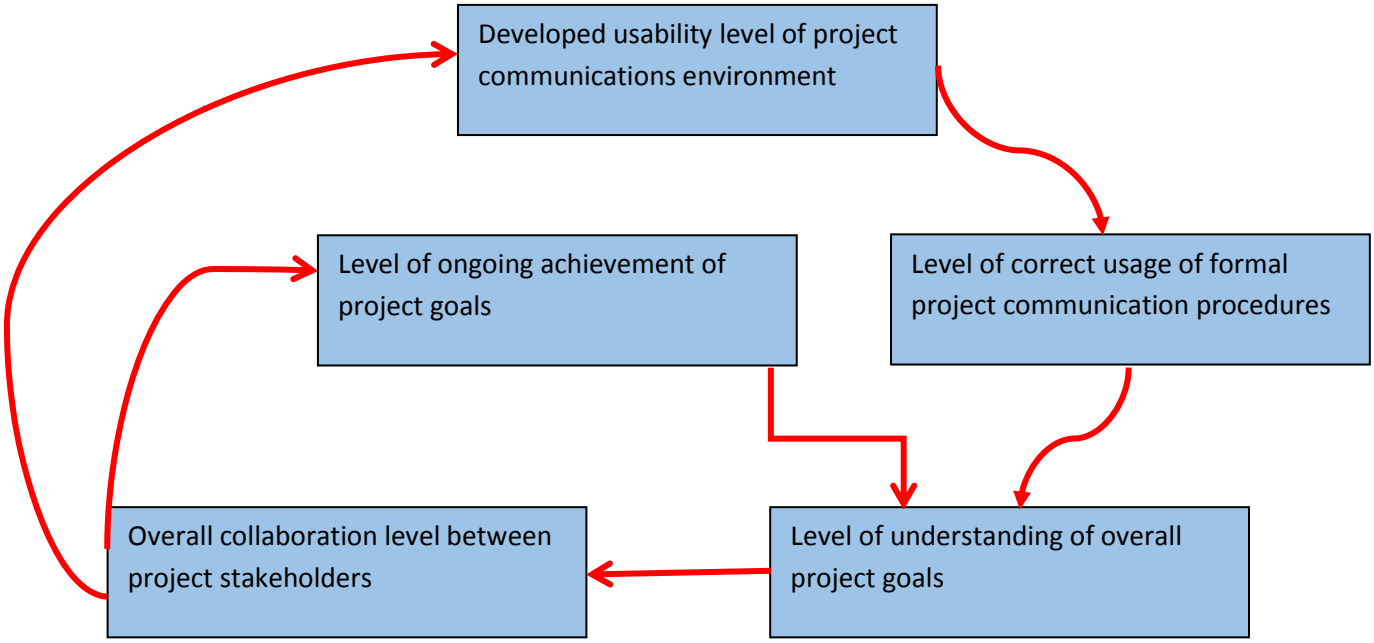
Figure 5.3 Interrelationship digraph



Developed Usability of Project Communications environment is the main driver (4:0): Each of the other four categories is driven by this category; i.e. it accounts for variation in every other identified category. No other category has this property so this is the core category.

An influence diagram below representing the preliminary theory of effective constructio9n project communications was developed using the variables identified.

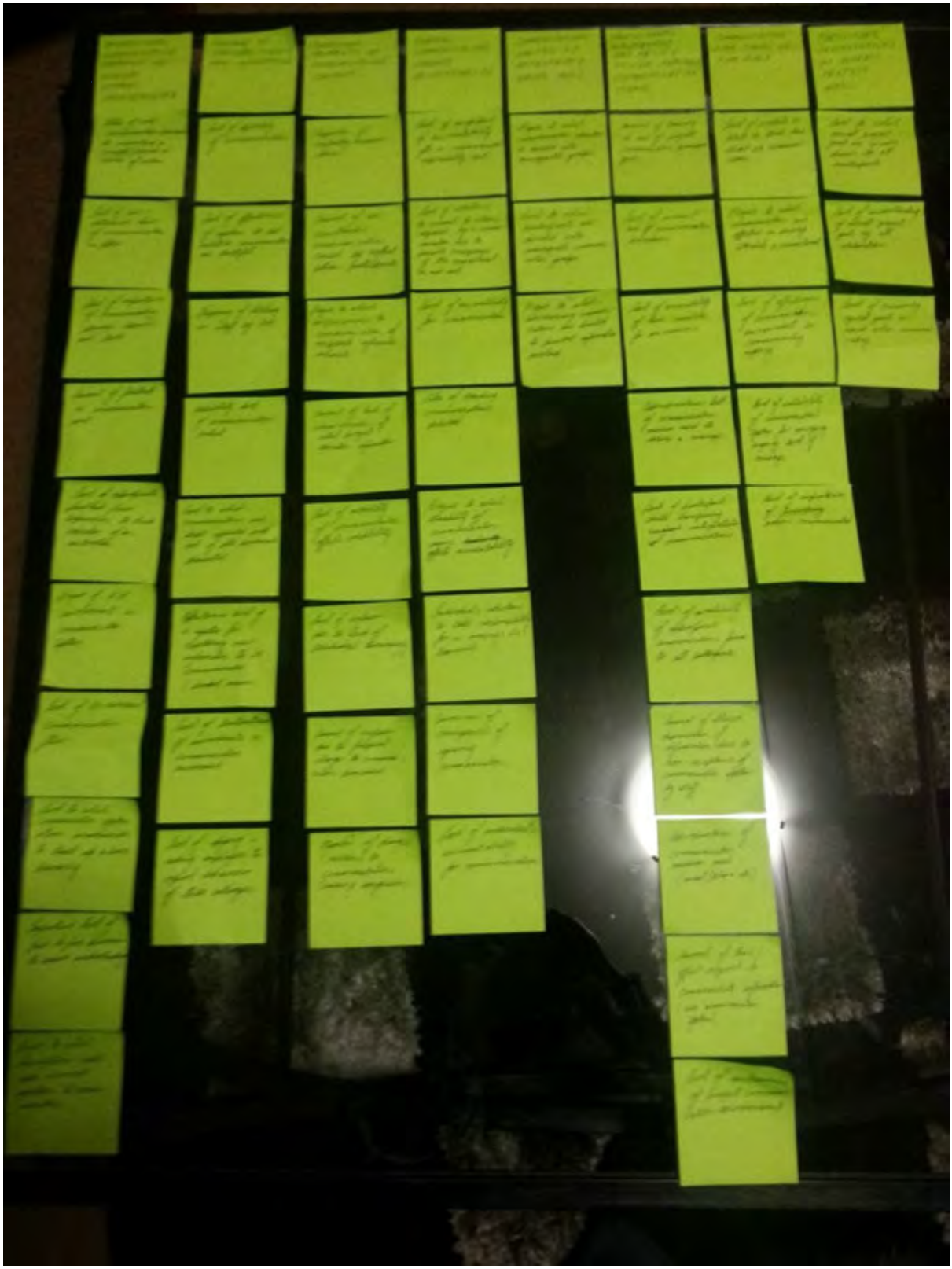
Figure 5.4 Preliminary theory of effective project communications



A second round of interviews was then carried out, with questions relating to the core category. Observations of transactions in this context were also made.
The same process of grouping and re-grouping from a higher level of abstraction as was done for the open coding stage was completed. The outcome of this process can be seen in picture 2 below.

A new set of variables was identified around this category and their relationships analysed. Using these newly identified codes, an influence diagram was developed. The core category became the focus of further data collection and selective coding focused only on the core category. Only relevant data was used for this coding. A number of sub-categories relating to the core category were identified and used to build the final theory of effective construction project communications. The influence diagram below shows which factors need to be present and how they should interact in order enhance the functioning of this core category.

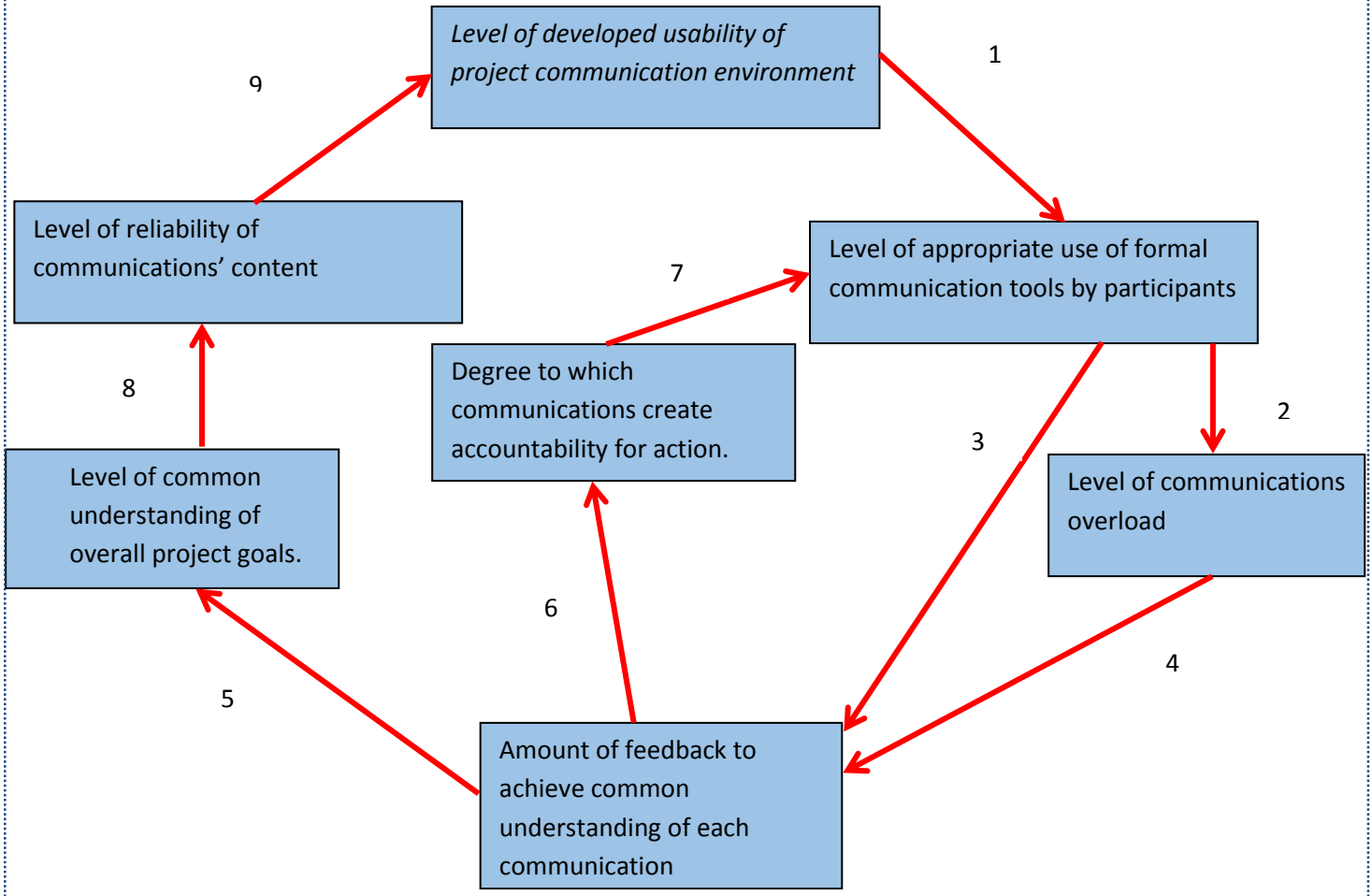
Figure 5.5 Grouping of theoretical codes



5.4 Final Theory

The final theory is represented by the diagram below. See Appendix 7 for development and arguments/evidence supporting the relationships between the theoretical codes.

Figure 5.6 Final Theory of Effective Construction Project Communications



See appendix 4, 5 and 6 for complete details of the process of developing the theory.
The influence diagram above (Figure 5.6) depicts the systemic interaction of the variables identified. The arrows indicate the primary sequence and direction of interactions between the variable factors in the text boxes. The evidence and reasoning for the theoretical influence they have on one another is described in more detail 5.4.1 below.

5.4.1 Explanation of theory

Construction project communication environments are made difficult to operate in by, among other factors, the different mind-sets, jargons and goals of the different groups involved (Dainty, 2006). The fact that projects are temporary organizations which involve these groups coming together for short periods without the opportunity to get used to one another's unique methods and language further detract from the usability of a project's communication environment (Packendorff, 1995).

The significance of the concept; "usability of project communication environment" for the purpose of this dissertation is as follows:
Communications take place within the combined environment of the project and the organisation carrying it out; which is the "temporary organisation" referred to earlier (Packendorff J. , 1995). Organisational culture, patterns of communication, the diverse groups within the organisation (and mistrust between them) as well as communication tools all form part of the project communications environment. The core category refers to the ease of use by project participants of all facets of the communications environment; including the formal and the informal systems and tools that are in place. If project participants understand the actual and the defined communications systems of a temporary organisation and are able to operate effectively using those systems and if the communication tools (email, telephone, access to others for face to face discussion, I.C.T.) are accessible to and understood the project communications environment becomes easier to use. If the environment is conducive to easy communications and the information exchanged is appropriate and trustworthy, participants will be able to understand requirements and function more effectively. (Dainty, 2006).

When a project is initiated, a communications plan is developed by the project manager (or management team) this gives rise to the environment in which communications will take place during the execution of the project. This highlights the importance of the role of the project manager in a project's communications.

The developed usability (see above) of a project's communication environment will have a strong effect on the degree to which users make appropriate use of the tools intended for the purpose of sending and receiving these project communications.

Wikforss (2007) found that users of a project information communication technology (ICT) system avoided using the system as they perceived that it wasted time, was overly complicated and required them to leave the construction site so that they could be at their computers in their offices. Users felt that time spent logging on was wasted and information was difficult to find in the system. They therefore used the network system as little as possible and started using other more immediate and direct forms of communication. The network was simply used as a store of information and did not act as a two way communication system for project communications related to necessary activities, a low level of usability of this part of the project's communications environment. (Wikforss, 2007) Note that ICT systems are not project communication systems but tools used within communication systems.

Small and medium professional firms have been found to be reluctant to adopt ICT systems. Usability factors such as incompatibility between different ICT systems being used on the same project are cited as being among the causes of reluctance by project staff to use communication tools (Dainty, 2006).
Examples of the usability of a project's communication environment affecting project communications was highlighted by comments during interviews. An extract from the GH interview is inserted below:

"….really why they were successful, we had a good joint venture team, with Lambert's, Canada. And Murray and Roberts and we had an absolutely brilliant client in BHP Billiton - - everybody worked as a team, the communication on that job was excellent. I'll give you an example; for every project manager there was a (client) project manager sat in the same area as the EPCm (PM). And on the site, each area manager or area engineer had had his opposite number sat in the next office to him so he could communicate. So that… It worked so well that we did the same in the next project and we just carried it over and that was the most successful."

In the above example the project communication environment was easy to use (usable) because of the good relationships that existed and the proximity and accessibility of project staff.

Both the quantity and quality of communications generated within the project environment correlate with the effectiveness of project organization. (Packendorff, 1995) Correct use of the available communication tools will have an effect on both the number and quality of communications participants need to deal with. Provided the formal communications tools of a well-designed system (e.g. document stores, group emails etc.) are used judiciously by senders, a reduction in the number of communications sent and time spent attending to them would result. Extracting the required information and understanding from each communication would be more efficient due to the consistent format. Fewer informal communications would take place (see above) and this would reduce the chances of duplication and conflicting instructions being transmitted. My observation on the first project studied was that almost all information required by those on site to execute the project was available on the ICT system and if one was competent in the use of the system, the information was trustworthy and reasonably easy to find and clarifications could be requested.

It should be accepted, that some spontaneous, informal communication will always take place, especially when there is time pressure during the execution of a project. . Two way communication does however engender a spirit of community and trust among participants which will facilitate all communications, formal or informal. (Frame, 1995, p. 61) However if the formal means of communication are used to confirm these un-recorded verbal communications, misunderstandings will be prevented (Dainty, 2006).

Setting up a system of 2 way communication that is easy to use and accessible to the appropriate participants and training them in its use would ensure that formal tools are appropriately used.

Communication must include a two way process in order to ensure that the transmitter knows the communication has been received and understood. If there are mistakes in a message, feedback or discussion will expose this and the mistake can be addressed. (Torrington, 1998, p. 112) Such a process will help to ensure the reliability of communicated information. Cumulatively these mutually understood messages will improve the level of common understanding of overall project goals (Wikforss, 2007). ICT based communication tools for example are at risk of limiting participants' overall understanding due to their one-way communication characteristic, where information is centrally stored or sent by email. Participants often access information from this source as and when they need it without any

discussion or feedback process taking place. The design of such a system should be flexible enough to facilitate free discussion as well as easy acknowledgement and feedback tools. This discussion environment is required for the understanding demanded by complex projects (Wikforss, 2007).

It should be noted however that project participants' ability to easily generate a great deal of communications using the formal tools available may result in an over-supply of un-needed information and users of the system becoming overloaded with information. Thus communication technology should be used judiciously so that this situation does not arise (Dainty, 2006). Among the reasons for communications failing is information overload (when a person's capacity to fully process information at the rate required is exceeded). This would reduce the amount of two way communication and hence full understanding and alignment by both parties (Dainty, 2006).

If participants understand the information requirements of the various individual project stakeholders the risk of overload is mitigated.

The level of use of formal communication tools by project participants in a well-designed communication system will also have an impact on the amount of feedback received. If all users of the communications systems use them appropriately, information is more likely to flow both ways between sender and recipients. Note that systems should allow for informal verbal discussion as a component which will facilitate common understanding. Formal recorded information exchange can take place while unrecorded verbal conversations are used to align and create understanding (Wikforss, 2007). Appropriate use and understanding of the formal communication tools will enable participants to provide feedback easily, so the appropriate use of formal communication tools will affect the amount of two way communication (feedback) to achieve common understanding.

The above mentioned "communication overload" is another factor that will affect an individual's capacity to take in, process and attend to each communication thoroughly. Efficient two way communication by means of the appropriate use of the available formal communication tools without unnecessary additional conversations will reduce the time spent to achieve common understanding. Participants will be more likely to engage in two

way discussion to achieve common understanding in this case so this variable will feed into the amount of feedback to achieve common understanding variable.

The common understanding by participants of overall project goals will be affected by the amount of feedback (two way communication) that takes place in order to achieve common understanding of each communication. Two way communications will allow misunderstandings to be cleared and errors to be discovered and corrected. If effective two way communication between sender/recipient takes place, there will be common understanding as to what actions are required, allowing project participants to collaborate effectively, creating agreement as to which group or individual is responsible, thus accountable for the required outcome (Dainty, 2006).
The usefulness of verbal discussion backed up by an email or meeting minutes to record decisions was highlighted in a number of interviews (GH, GI).
Two way discussion will affect the level of common understanding of overall project goals.

Two way discussions (feedback) that are recorded by the correct use of communication tools will create a record of decisions and hence accountability for those decisions.
If, however some of the project participants do not use the communication tools available, informal unrecorded communications with inaccurate content and which bypass the communication system and do not flow through the management hierarchy may become commonplace. Common understanding between all stakeholders may not be achieved in this environment, resulting in mistakes and a lack of accountability. MS mentions his experience of the "lack of an auditable trail if something goes wrong" in his interview. Discussions to achieve understanding that are captured on communications tools will directly affect the degree of accountability.

The degree to which communications create accountability may in turn cause some participants to avoid the use of appropriate formal communication tools in order to "dodge" accountability for their actions, so affecting the level of appropriate use of formal communication tools. The degree to which communications create accountability for action will influence the level of use of available communication tools by participants. Project participants sending messages will want to create this accountability to ensure that their requirements are carried out. In the busy construction project environment, using a formal,

traceable communication s medium is an efficient way of putting this accountability in place and on record. When a participant is made accountable for an action he will be more inclined to use formal recorded means of communication to provide his feedback as the required actions are executed. If project some participants circumvent the established formal communication channels dictated by the organisational hierarchy, then responsibility and accountability cannot be determined. Defined responsibilities by participants for outcomes is associated with an effective structured communications environment. In his report on the Scottish Parliament project, Black (the then Scottish Auditor General) praised the project execution plan as a document that among others comprehensively set out responsibilities and lines of communication (Dainty, 2006).

A high level of common understanding of overall project goals will improve the reliability of the content of individual communications. Communications will be created and seen in the context of overall project goals which will assist in the correct message being sent and understood.

An example of lack of understanding of project goals information and its negative effect on the project is captured from an observation on one of the projects studied:

Destruct drawings do not agree with SOW (Quality of front end work done on project), (Level of quality of communication) -- SOW was not updated by Project Administrator. He was unaware of drawing changes. (Communications Failure between D.O. and site.) C23: Level of communication between disciplines

The level of common understanding of overall project goals will thus have an impact on the reliability of communications' content

Wikforss (2007) concluded that the level of reliability of communications' content will affect the level of usability of the project's communication environment. If owners of information are not confident of its accuracy and reliability, they may hold back on making it available to those project participants who need it. This will limit the usability of the communications environment due to incompleteness of information available. Last minute corrections that have to be made once information has been published will also result in compromised usability of the communications environment for the same reason. Conversely, Frame (2003) concludes disseminated information that has been discussed and agreed upon by participants will be perceived as reliable and will engender a spirit of trust and cooperation,

improving confidence and strengthening the usability of the project communication environment.

Thus, if participants feel that communications that are sent or received are trustworthy and reliable then a higher degree of trust in the general communications environment of the project will develop. This feedback will create a virtuous cycle and the usability level of the project's communication environment will improve as the project proceeds.

5.5 Conclusions

In the above analysis, "developed usability of the project communication environment" was found to be the central variable that impacts on how effective communications will be in a project. Actions that could be taken to address the issues identified and implement the processes to facilitate systemic functioning of the theory are areas that require further research. As the theory includes feedback loops that are reinforcing, interventions that have highest leverage would include those that improve the core variable or the linking variables, for example, recruiting of experienced staff who understands project communication systems and tools. The theory would be tested by implementation of these actions.

A discussion of this finding follows in the next chapter, chapter 6 under the sub-headings validity, strengths and limitations and utility and transferability. Areas for possible further research are also mentioned.

6 Chapter 6: Discussion of Findings

6.1 Introduction

This chapter opens with a brief clarification and specification of the meaning of the concept "developed usability of the project communication environment" which emerged as the core variable during this recent study. This clarification will facilitate understanding of the theory and the discussions that follow. Thereafter follows a discussion of the theory proposed as an answer to the research question of this study.

The theory that a high level of usability of the project communication environment is a core requirement for effective construction project communications to take place may seem obvious. Many construction projects do not seem to achieve this state and fail because of it. Indeed achieving it may be difficult if one considers the sub categories needed to bring about this state. (Aucoin, 2007, p. 8).

The sub-categories explain how easy or difficult it is to develop an easily usable project communication environment in practice. Some of the benefits of having such an environment in place are highlighted as are the negative effects that are experienced if project participants perceive the system as being unwieldy and do not use it as planned. Literary sources and field data are used to test the reliability and validity of the discussion and conclusions drawn are included in the discussion as supporting evidence for claims made.

The chapter closes with a review of the relevance, validity and legitimacy of the research study as well as implications for practice.

6.2 Clarification of the meaning of the core variable

To clarify what is meant by the variable "developed usability of project communications environment" this should be as seen from the point of view of the users of the project communications environment; the project participants, in particular the project team members. If members perceive the environment they work in as being conducive to effective communication and they are able to achieve their communication objectives in the project environment without difficulty; then an easily usable project communications

environment is in place.

The project manager should ensure that this communications environment is developed as early in the project as possible.

6.3 Discussion of the theory

The influence diagram (Figure 5.4 repeated below as Figure 6.1) represents the proposed theory of effective construction project communications in response to the research question - How can project team communication systems be improved to ensure that all stakeholders have all the information and understanding required to function efficiently, effectively and timeously?

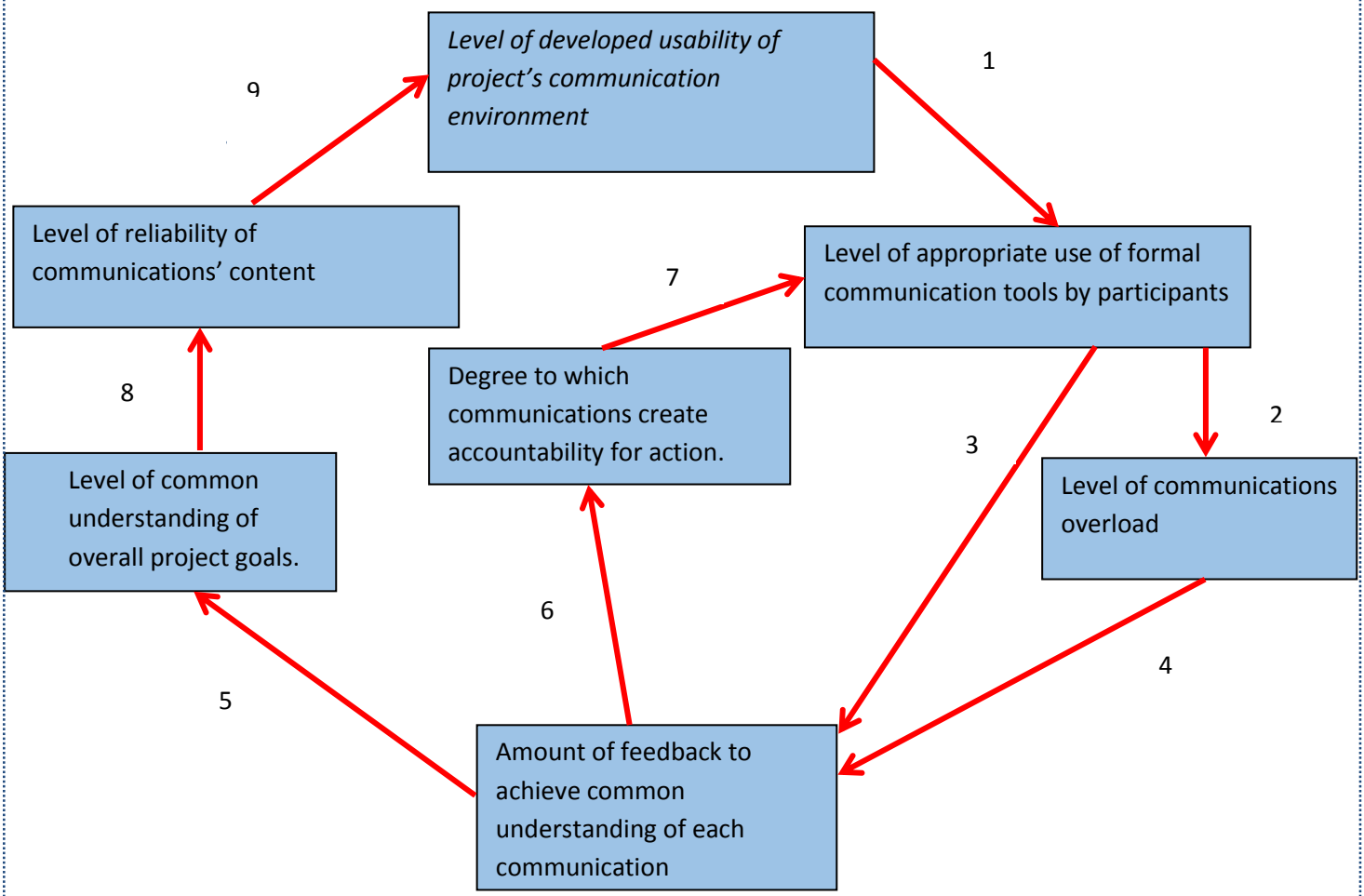
The arrows indicate how each of the identified variables affects the others and highlights how variables interact in a cyclical manner.

The discussion of the theory that follows should be read with reference to Figure 6.1 below, as the discussion follows the sequence of the variables as depicted in the diagram.

The assertion that a construction project's successful execution depends heavily on effective communication is well supported by the work done by respected researchers as well as empirical and anecdotal evidence. Many of the problems encountered by project organisations during the execution of projects stem from communication shortfalls. Dainty (2006) concludes that effective communication is the life blood of a project. He makes the statement: "Rather than viewing effective communication as an important facet of project-based management, it is viewed as the essential prerequisite to successful project based management, if we communicate more effectively, then other managerial processes should work better as a result." Despite the problematic nature of the project communication environment, little work has been published in this field (Dainty, 2006, pp. xvi, 142).

A construction project communication environment that is easily usable and supported by participants will facilitate these effective communications. A number of examples of the problems that can result from communication failures can be found in the observations from this study. Observation 2.1 (appendix 9) where conflicting communications caused a procurement officer not to act on an important request illustrates the point.

Figure 6.1 (repeat of 5.4) Final theory of effective project communications



The concern that set the direction for this study; "Construction project communication that gives rise to late or inappropriate actions; or no action at all can severely damage project delivery. Required actions by project stakeholders are often carried out late. The most frequent reason given is outstanding information." aligns with the situation described. Observation 2 Appendix 9 provides further evidence. The foreman concerned did not understand the client's complicated communication procedures and thus had to delay carrying out the operation required while he looked for assistance in understanding how to communicate his request.

Because of the temporary nature of projects and their short period of involvement there is not much time for participants to learn how to function in a communications environment that is not easily usable. Factors that may influence user friendliness of the project communication environment include the variables identified in the theoretical coding phase

of the research. Some *symptoms* of a low degree of one or more of these variables could include:

- Participants not acting on communications because they do not trust their content (Dainty (2006) refers to the lack of trust between project participants leading to inaction and manipulation of information. He also mentions situations where participants allow their emotions to impede their communication due to a lack of trust between parties.)
- Participants not being able to act on communications because of communication overload. (Faulty transmission can also occur when a receiver is expected to absorb too much information or when they lack an insight into the circumstances around the transmission (Dainty, 2006, p. 27).
- Lack of appropriate use of formal communications creating confusion and no accountability resulting in inaction or conflict between participants. (New team members are not trusted until they are sufficiently "socialised" in the eyes of established members (Dainty, 2006, p. 105).

A project participant introduced into an environment where such conditions are present may find a situation in which participants spend a disproportionate amount of their time trying to find or verify information. Because project progress would be slow and mistakes common, it has the potential to impact on the culture of the project environment (for example a culture of withholding information could develop), further damaging the project's communication environment (Wikforss, 2007).

The lack of reliable accurate timeous information is not just an inconvenience to project team members causing minor disruptions; it has a major impact on project delivery. It has been estimated that in recent British civil engineering projects, schedule delays of up to 30% have resulted from late or inadequate provision of information (Dainty, 2006, p. 33).
It is therefore important for the project manager to develop an easily usable communication environment in the very early stages of the project. Participants joining the project would then be able to become functional communicators sooner (Dainty, 2006, p. 95).

The answer to the question that arose from the original concern: viz. "How can project team communication systems be optimised to ensure that all stakeholders have all the

information required to function efficiently, effectively and timeously?" will help to provide answers that will appropriately address the concern. The concern raises the issue of ineffective project communications; the question seeks to answer how reliable, appropriate information can flow between the right individuals timeously so effective actions can result.

The theory of effective construction project communication that has been developed in the previous chapters provides a solution to the concern. The theory postulates that if the project's communication environment is easy for all participants to use, effective project communications will result

6.4 Review of the validity and legitimacy of the research study

6.4.1 Argument for validity

Grounded theory, which is a well-established qualitative research methodology, was used to build the theory. Data was gathered from appropriate literature, observations and interviews. A rich varied and rigorous data set was created by:

- Conducting interviews with senior managers and staff at various levels and of different nationalities to ensure a range of world views on both the client and the contractor side,
- Formulating questions that were neutral and open ended so as not to influence responses from interviewees,
- Conducting multi-site fieldwork. Observations took place on a major petro-chemical project in South Africa and a power station project in Saudi Arabia, both on site and in project offices. Including participants' feedback.
- Reviewing literature from credible sources and relevant to the research question. Some literary references were from books identified by intranet searches at the University of Cape Town and other libraries, using key words for both title and content. These works were all by respected academics who in turn cited respected sources. Other literary references were from scholarly articles found on the internet. All references are quoted using the APA system of referencing and can thus be confirmed by reference to the sources. Also included were peer reviewed articles sourced from scholarly journals.

- Applying the Grounded Theory Methodology to emerge the core variable around which to build a theory to answer the research question. Literary sources consulted later in the research were identified by the Grounded Theory data as it narrowed Lists of field observations made and interview transcripts are appended for reference it narrowed the focus of the study. Grounded Theory, by its design, has the effect of identifying the specific focus area that required study – the core variable.
- Providing an audit trail in the form of lists of field observations made and interview transcripts.

The relevance and applicability of the theory built from the data sets was strengthened by the following:

- The literary references used earlier in the study were all of a general management and project management nature not focusing on the construction project communication aspect in particular. This ensured a wide range of data input sources. The interview questions related to general project experiences by the interviewees.
- Although the observations conducted related to the South African petroleum and the Saudi power station projects only, they could be applied to other projects.
- The references used and theories developed are applicable to any construction or engineering project and would have relevance to other types of temporary organizations as well. Effective communications are needed for the successful execution of any project. The construction project environment is the business environment that the companies studied work in. They experience the situation and concern as described in Chapter 1. The observations and responses to interview questions therefore reflect the issues prevalent in the environment which the concern identifies.

  The focus of this study therefore aligns with the concern expressed in Chapter 1.

6.5 Strengths and possible limitations and how these were mitigated

Strengths of this study include:

- Quality of sources: Most interviewees chosen were well experienced in the field of construction projects and ranged from junior engineers to director level. Due also to the range of ages, cultures and nationalities, it is felt that a good range for views was canvassed.
- Quantity and variety of observation data gathered: A large number of observations were conducted randomly on site and in the offices, so there was little chance of bias towards a particular aspect of the projects.
- Duration of the study: The study was conducted over a period of two years allowing research to be done in two countries and observations to be made in different phases of the projects. It is felt that this allowed for more balance in the data gathered.

While this study is presented as credible, confirmable and meets qualitative validity criteria, it may contain perceived weaknesses in some areas. The following indicates how these limitations were attended to in order to mitigate the potentially constraining influence.

- Observer bias:
  All research was conducted by one researcher. This could have resulted in interview questions and identified categories as well as the interpretation of observations being coloured by the researcher's own prejudices and perceptions. It is possible that a second researcher reviewing the data may have come up with differently defined categories in some cases. This may have caused slightly different conclusions to be reached. However, the use of the Grounded Theory Methodology and the provision of an audit trail in the Appendices makes any bias transparent and offers other researchers the opportunity to interrogate the data.
- Number of projects studied:
  Only two construction projects were studied. It is possible that the study of

projects in different geographical locations from the ones used may have yielded slightly different results. However the fact that interviewees were widely experienced in most cases and literary sources from a number of writers were consulted addresses this.

- Few interviews were conducted:
  Interviewees were carefully selected to provide insightsfrom a range of disciplines and from both contractor and client side. A large amount of data was gathered (see interview transcripts appended) which was of good quality due to the level of seniority and experience of interviewees. The grounded theory methodology provided guidance as to who to interview next by identifying the data required. Saturation was reached when no new variables were identified from both interviews and observations.
- Data collected from projects in different industries and countries should not be analysed and used in the same study due to the differences in world views and norms that are prevalent in those industries and countries:
  The issues faced by project teams are very similar wherever the project is being executed and most of the variables identified during the study by interview and observation were the same for both projects studied. Variables such as “level of common understanding of overall project goals” and “ level of communicationsoverload” were equally applicable to both projects. The means used to implement these requirements may vary in different environments.

6.6 Argument for utility and transferability

The theory developed from this study has the potential for transferability to other contexts. It can be useful to researchers doing studies in similar fields as well as to any participant in temporary organizations wishing to gain insights into construction project communication. In addition the findings could be used to structure and develop groups such as project teams.

To guide researchers with respect to transferability, the research the research procedures were examined in detail. The identification and explanation of concepts that need to be in place for the usability of the construction project environment to develop are provided.

6.7 Areas for further research

As this study was a naturalistic (single researcher, specific industry and context), only two projects in one sector of the industry were included. Further research at other projects may have placed emphasis in other areas, leading to different conclusions being drawn.

One of the observations made revealed a possible case of cultural or educational factors leading to a team member not using safety equipment. Factors (such as cultural educational and language differences in project teams) did not emerge as significant categories in this study, although some of their effects could be addressed under the “Level of common understanding of overall project goals” variable, it could be explored in further research.

Some of the effects of these factors would be addressed under the “Level of common understanding of overall project goals” variable. Cultural factors are recognised as very important and are possibly a good topic for a future study.

6.8 Practical considerations for implementation

Implementing the sub-categories in order to develop a usable construction project environment.

A number of difficulties will have to be overcome in order to achieve the ideal state indicated by the theory. Without the sub-categories in place, the required usability of the project communications environment will not develop. Putting these sub-categories in place will be the responsibility of the project manager and may not be easy to achieve.

The implementation of systems to enhance, for instance the category “Level of common understanding of overall project goals” will require considerable investment in training and

on-going communications to all relevant project participants. (Wikforss, 2007, p. 5) (Dainty, 2006, p. 12)

Projects are generally subjected to economic analysis before they go ahead and it may be difficult to implement such systems in the face of budget and time constraints. The project manager would normally be the driver of such facets of the project execution strategy and he would have to convince the project sponsors that the extra costs and schedule delay would be offset by the benefits that would accrue from their implementation. Achieving this could be difficult, as the sponsors may not have a good understanding of the importance of the communication environment required to carry out a construction project. The project manager's standing and authority in the overall project structure as well as budget and schedule constraints may not allow him to implement these strategies without buy-in from the project sponsors. (Dainty, 2006, pp. 13 - 17)

Similarly a putting a system in place that records communications and holds relevant participants to account, ensure use of communication tools, limit information overload etc. may not always be achievable in "real world" situations due to among other factors, lack of buy-in from sponsors, skills availability and funding (Dainty, 2006) (Belout, 2004).
This requires skill and resourcefulness on the part of the project manager to create the ideal environment despite the probable constraints faced.

6.9 Summary.

Having identified the core category and its relationship with associated categories, the theory was examined for legitimacy, transferability and practicality for use. It was acknowledged that some difficulties may be encountered in the practical implementation of the theory. Some of the probable barriers to implementation are identified and explored.

The findings indicate possible areas for further research.

Chapter 7 which follows draws conclusions from the research findings and discusses some aspects of the

7 Chapter 7: Conclusions

7.1 Introduction

Effective communications are needed for the execution of every phase of a project. No project activity can take place without communications initiating it and guiding it. The field research conducted during this study underlined how important effective communications are to the success of a construction project. Many of the field observations provided evidence that in the absence of reliable and appropriate information delivered timeously to the right persons, project activities can go awry.

It also emerged that communication systems that are understood and accepted by all participants must be in place from early on in the project. “Good” communication does not happen spontaneously in projects, especially in large ones. There are many obstacles in the way of achieving effective communications in the project environment. Developing and putting effective communication systems in place requires skill on the part of those responsible for doing so. This responsibility falls mainly on the shoulders of the project manager (Dainty, 2006).

7.2 Requirements for a project communication environment to function effectively

An easily useable communication environment is a requirement for communications in a project to be effective. Some of the practical hurdles to overcome while establishing this environment are discussed below.

7.2.1 Environment to be developed early

Communication is needed from the beginning of the project. All projects go through the basic steps of conceptualisation, idea development, design, execution and hand over to client. Communication is needed during each of these stages to ensure that the information generated is shared with the appropriate participants. Feedback is required to ensure there

is agreement and understanding and responsibility and accountability should be generated by the communication.

An easily usable communication environment should be in place from the very early stages of the project to ensure participants do not develop their own informal unrecorded methods of communication that will persist and make it more difficult to develop an effective communication environment later (Packendorff, 1995) (Dainty, 2006).

7.2.2 Communication environment is not only formal, written communication

Communication takes place in many forms, not only emails or formal meetings. Many valuable communications take place in informal settings like telephone conversations or unscheduled, meetings in the office and on site. Here easy two way communication takes place and understanding is easy to achieve because of the elements of communication that are present: verbal, and non-verbal with immediate feedback and, if on site, the problem being discussed is visible, in front of the parties discussing it. (Wikforss, 2007) (Aucoin, 2007)

7.2.3 Interpersonal relationships

Constructive relationships between the participants will help to make communication effective, especially during informal discussions mentioned above. If there is mistrust or dislike for one another, or “political games” are being played then information shared in these conversations may be limited and not reliable. It is part of creating a usable communication environment to try to foster good relations between participants and establish a sense of common purpose (Aucoin, 2007). Once effective communications start taking place in the project, constructive interpersonal relationships will be reinforced (Dainty, 2006).

7.2.4 Communication tools

To ensure the level of usability of the project communication environment, the tools to be used to carry out communications must be accessible, easy to use and easily understood by all. The non-acceptance of ICT introduced to a construction project described by Wikforss is a good example of this (Wikforss, 2007). Understanding and acceptance of communication systems can be facilitated by appropriate training and the development of a common sense of purpose.

7.2.5 Reliability of communication

The usability of the project's communication environment will also depend heavily on the participants' trust of the content of communications received and the understanding and commitment created by communications that are transmitted.
If information received is perceived to be of poor quality, mistrust in communications will develop, motivation will suffer and the communication environment will be negatively affected.

7.3 The Project Manager's role

It is the P.M.'s responsibility to create the project's communication environment. He will have to be able to communicate to participants at all levels and put the systems in place that will determine how communications within the project and those with external parties will take place. When the project kicks off, before the project team is fully in place, the P.M. will have to start putting together the communication structure of the project. This together with his leadership abilities will help to determine how usable the project communications environment is to its participants.

Placing participants close together in the same location so that face to face discussions are easy, having telephone and appropriate ICT tools in place, arranging sufficient meetings will

all contribute to participants feeling that they are working in a usable project environment. Possibly the most difficult quality to add to the communications environment is that of a feeling of common purpose and trust amongst the participants. The P.M. will have to display strong leadership qualities to achieve this. He will not be able to hand pick all project participants, so skill levels and personality differences that may result in office politics will have to be accommodated. Conflict between participants and a lack of mutual respect and trust, all work against a culture of open communication and make the P.M.'s role extremely demanding and problematic.

The P.M.'s leadership should create a strong enough sense of common purpose and unity in the team to overcome these problems.

More difficult to incorporate may be aspects of the project and individuals over whom the P.M. has no authority, such as contractually driven relationships, the client's project participants and senior members in his company (Dainty, 2006).

7.4 Conclusion

Putting in place the factors that will facilitate the development of an environment which project participants accept and in which they are able to communicate easily using the procedures and tools provided is the key to effective construction project communications.

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9 Appendices.

9.1 Appendix 1- Table of major literary sources showing main focus, theory/conclusions and provenance

Writer/ Book/article title	Main focus of study	Theory /conclusions	Provenance
Dainty, Moore Rethinking Communication in Construction	Construction project communications. Individual and group communications and communication systems	Due to the complexity of the industry, no single paradigm exists for communications. Managers should tailor their approach to suit the project on hand.	A. Dainty, A. Moore and M. Murray are lecturers at U.K. universities. Evidence is in the form of references to scholarly works and case studies.
Aucoin Right Brain Project Management	Decision making in unstructured, changing project situations.	Management needs to foster emotional attachment to projects by team members for optimum performance	Previously a Research Associate Professor at Texas A&M University: Aucoin currently consults. Evidence is in the form of references to scholarly works and case/statistical studies.
Packendorff Inquiring into the Temporary Organization	The shortcomings of the current bases for research into project management and the need for research to generate mid-range	Different types of projects need different theories. Empirical fieldwork is required to build these theories	Associate professor of Industrial Economics and Management, KTH Royal Institute of Technology Evidence is in the form

	theories on projects.	Range of theories will enhance the understanding of projects	of references to scholarly literature.
Tushman. External Communication and Project Performance: An Investigation Into the Role of Gatekeepers	The role and effectiveness of gatekeepers in the facilitation of oral project communications where a lack of linguistic commonality is an impedance to communications	Gatekeepers can facilitate the flow of information in organizations by means of a two-step process.	Harvard University Business School. Evidence is in the form of references to scholarly literature.
Frame Managing Projects in Organizations	Structure of project teams, role of project manager	Analysis of practical project management problems and solutions to them	Evidence is in the form of case studies, references to P.M.I. and scholarly literature
Belout Factors Influencing Project Success: The Impact of Human Resource Management	The effect of human resource management on project success	Analysis showed the personnel factor had a minor correlation with project success.	Evidence is in the form of references to project experts and previous study by others
Wikforss Rethinking Communication in Construction	Improvement of organization, group processes and work procedures in the sharing of knowledge between different organizational domains. Creation of an effective platform for collaboration through shared ICT business	Project communication structures should consider the suitability of information and communication technology systems used for the specific	Evidence is in the form of case studies/scholarly literature.

	tools.	project environment.	

Table 2.1. Focus and theories generated or conclusions reached in the main literary sources used.

9.2 Appendix 2 -Interview Questions.

1. How long have you worked in the project environment and in what capacities? Talk about a few of the most and least successful projects you were involved in. What role do you think communications played in the success / lack of success of these projects?
2. Project staff; in the office and those on site seem to have different approaches and different main drivers for their behaviour. Office based staff seem more inclined to be bound by procedures and reviews whereas those on site are under more direct pressure to 'get the job done'. These teams have to work together. What effect do you think the two different approaches have on communications between the two groups?
3. Projects go through phases including conceptualisation, basic design, detailed design, construction and handover during their lives. These phases are executed by different teams in many cases. The information from each phase has to be passed on to and used by the team handling the next phase. This team may consist of completely different members. What problems have you experienced with this communication process?
4. Would you agree that a good deal of project information is exchanged informally? This information is not captured in meeting minutes or other documents, but is acted upon. What are your views on this?
5. Do you feel that further measures should be taken to capture detailed un-documented knowledge that is lost when staff leaves during the life of a project?
6. Do you feel that improvements could be made to communications between client and EPC(m) contractors to help ensure fewer late design changes and that the asset that results from the contract meets the client's expectations.
7. Do you have any other opinions on this subject that you would like to contribute to the interview?

9.3 Appendix 3: List of Open Codes

Open Codes	
C1: Level of self-interest of individuals interfering with communication outcome	**C2: Quality level of content of communication.**
C3: Level to which communication is translated	**C4: Level of effectiveness of supervision of**

into usable form.	team members.
C5: Amount of information communicated between different parts of team.	C6: Appropriateness of communication medium.
C7 Level of confidentiality of information.	C8: Level of integrity of communicated message.
C9: Amount of design and pre-planning.	C10: Degree to which communications are kept updated.
C11: Timeousness of communications.	C12: Level of consistency of message in communications.
C13: Level of cooperation/collaboration among stakeholders.	C14: Level of difference between world views.
C15: Level of use of contract to communicate.	C16: How easy it is to act on the communication.
C17: Level of use of formal communication procedure.	C18: Importance of two way communication.
C19: Level of understanding of overall project goals by all levels of workforce.	C20: Period of time taken to react to communication.
C21: Relationship between sender/receiver of communication.	C22: Level of communication between higher and lower level employees.

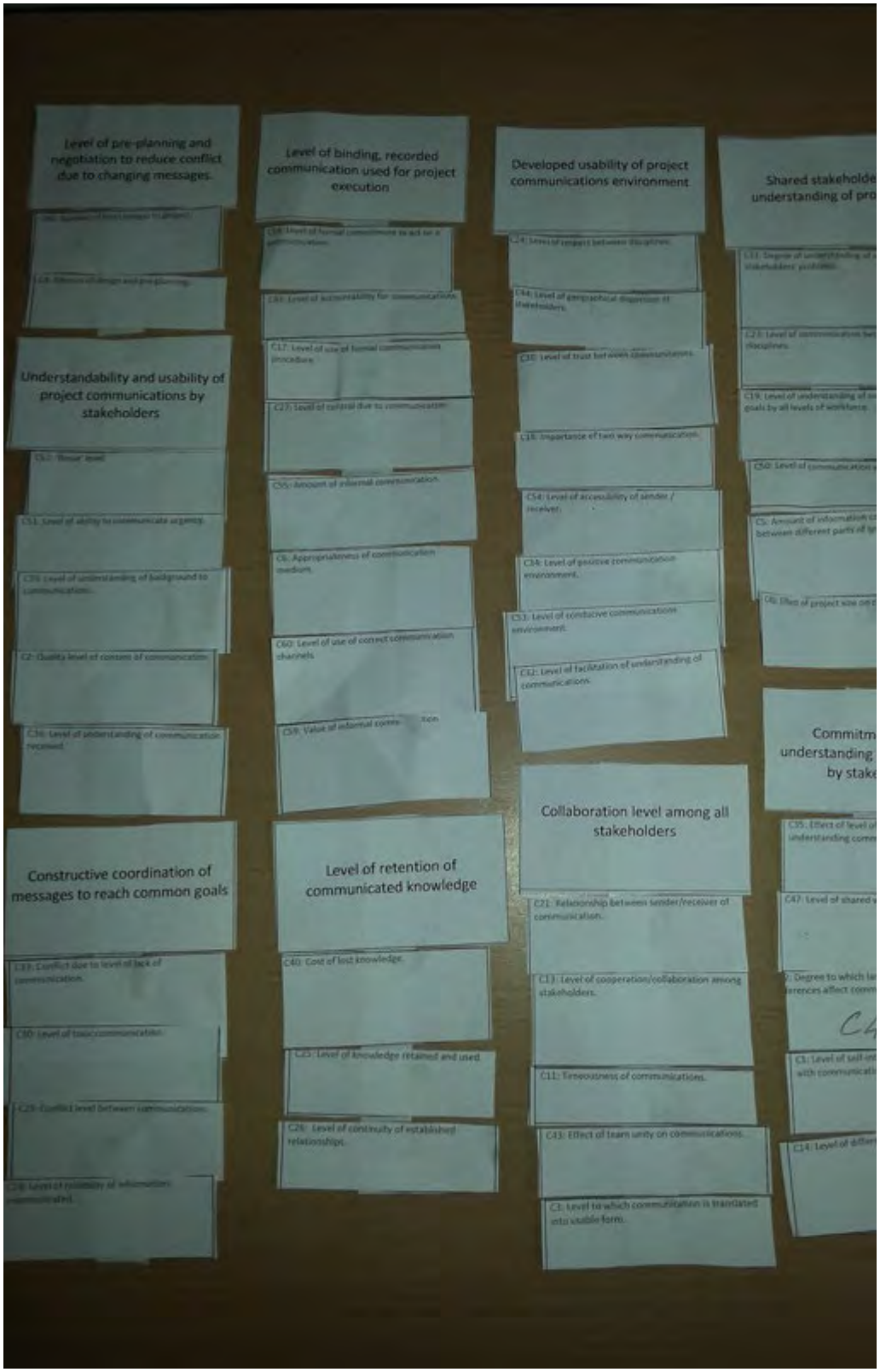
C23: Level of communication between disciplines.	**C24: Level of respect between disciplines.**
C25: Level of knowledge retained and used.	**C26: Level of continuity of established relationships.**
C27: Level of control due to communication.	**C28: Level of reliability of information communicated.**
C29: Conflict level between communications.	**C30: Level of toxic communication.**
C31: Degree of understanding of other stakeholders' problems.	**C32: Level of facilitation of understanding of communications.**
C33: Conflict due to level of lack of communication.	**C34: Level of positive communication environment.**
C35: Effect of level of work experience on understanding communications.	**C36: Level of understanding of communication received.**
C37: Level of reluctance to communicate face to face.	**C38: Level of trust between communicators.**
C39: Level of understanding of background to communications.	**C40: Cost of lost knowledge.**

C41: Level of communication with end user.	**C42: Degree to which language and culture differences affect communication.**
C43: Effect of team unity on communications.	**C44: Level of geographical dispersion of stakeholders.**
C45: Effect of project size on communications.	**C46: Number of late changes to project.**
C47: Level of shared work experience.	**C48: Amount of lost knowledge due to staff movement.**
C49: Level of accountability for communications outcomes.	**C50: Level of communication with end user.**
C51: Level of ability to communicate urgency.	**C52: 'Noise' level.**
C53: Level of conducive communications environment.	**C54: Level of accessibility of sender / receiver.**
C55: Amount of informal communication.	**C56: Amount of use of communication as a project driver.**
C57: Degree to which schedule is used as a project communication tool.	**C58: Level of formal commitment to act on a communication.**

C59: Value of informal communication.	**C60: Level of use of correct communication channels**
C61: Identifying required information to be communicated.	**C62: Suitability of staff to work effectively in the project communication environment.**
C63: Divide into manageable communication groups to reduce no. of messages.	**C64: Appropriate level of detail for communication recipient.**

9.4 Appendix 4 – Open codes grouped.

Picture 1 below shows the outcome of the grouping process



Picture 1

The five concepts (theoretical codes) identified were then further consolidated and the initial concept names reviewed with the aid of theoretical memos.

The T.M.'s applicable to the consolidation process are shown below.

T.M.
Period for which project has been running.

- This is a variable which does influence the project and the B.S.P.'s that take place, but cannot be controlled. As the project progresses; time passes.
- As time passes groupings among project stakeholders form, relationships develop, and are then broken as the project goes through its phases. This could result in better or worse collaboration between stakeholders during the project as it progresses. Therefore there is no predictable relationship between project communications and time for which project has been running. It was decided to ignore this as it is not a *controllable* variable.

T.M.
*Level of organisational fragmentation of the proj*ect and *Level of synergy between team members*: *Overall collaboration between project stakeholders"*

- Level of synergy seems to be the inverse of level of organisational fragmentation.
- The greater the degree of organisational fragmentation, the less likely it is that synergy can be achieved as interfaces between the separate 'fragmented groups' will tend to block effective communication and working toward common goals.
- These two concepts are therefore related (albeit inversely) and can be described jointly as 'overall collaboration between project stakeholders.

T.M.

"Ability of project manager to facilitate effective project communication environment" and *"Effectiveness of project communication environment"* were merged under the slightly broader concept *"Developed effectiveness of project communication environment"*.

- If the project manager has the ability to facilitate a more effective project communication environment and he does, then effectiveness of the project communication environment will be an outcome.
- Developed effectiveness of project communication environment describes both of these related concepts.

TM.

"Amount of informal communication of project information" and *"Amount of feedback from message recipients"* were merged under *"Degree of correct use of developed formal communication procedures".*

- Amount of informal communication will decrease as the correct use of formal communication procedures increases. There will be less need for information through informal channels if formal channels are used correctly.
- Amount of feedback will be affected by the degree to which developed formal procedures are used. The formal communication procedures will incorporate feedback as part of the communication process.
- The above two theoretical memos assume that the developed formal communication procedures are reasonably well designed and effective.

9.5 Appendix 5 – Theoretical codes.

The codes below were used to develop the C.L.D. illustrating the provisional theory.

Theoretical Codes	
TC1. Developed usability of project communication Theoretical Codes environment.	**TC2. Overall collaboration between project stakeholders**
TC3. Ongoing achievement of project goals	**TC4. Degree of correct use of developed formal communication procedures.**
TC5. Level of understanding of overall project goals	

9.6 Appendix 6

Theoretical memos relating to relationship between codes on C.L.D.

T.M.1

Relationship between: *Overall collaboration between project stakeholders* and *Ongoing achievement of project goals*.

- If the degree of collaboration between project stakeholders increases, the efforts to carry out the actions required to achieve the project's goals will become more effective. Synergy will improve and work will become more efficient. Is synergy between stakeholders a better code name than overall collaboration?

T.M.2

Relationship between: *Overall collaboration between project stakeholders* and *Developed effectiveness of project communication environment.*

- *Overall collaboration between project stakeholders* will help to improve the project's communication environment. Collaboration – the act of working together toward a common goal – will help to develop communication environment due to the shared goals and communication that will result from this code.
- If project stakeholders are collaborating they will jointly work towards improving understanding each other's communications.

T.M.3

Relationship between: *Developed effectiveness of project communication environment* and *Correct usage of formal project communication procedures.*

- As the effectiveness of the communication environment improves, stakeholders will tend to use the formal procedures which are part of that environment. So, if by using the drawings from electronic document stores for example, stakeholders can easily access latest revisions of drawings, there is no need for them to informally phone the drawing office or borrow a drawing from someone else that has a copy (there is no guarantee that this is the correct revision – just an assurance from that person).
- This brings up the concept of *ease of use or convenience of using a system*.
- *Ease of use* must be part of the developed effectiveness of project communication environment code. Perhaps a sub-code.

T.M.4

Relationship between: *Correct usage of formal project communication procedures* and *Level of understanding of overall project goals.*

- *Correct usage of formal project communication procedures* will result in correct, up to date information being disseminated to stakeholders, provided the formal procedures are well thought out and implemented. Formal procedures should ensure that information that is sent out is the appropriate revision and that it has been reviewed and approved by the appropriate parties before being made available. Such information would be in a format that is unambiguous and understood by people in the industry concerned.
- Such information will reduce the probability of misconceptions regarding communications (as compared with informal communications which have not been reviewed and updated. Nor are these informal communications recorded so no one is accountable for mistakes arising from them. This concept of *accountability for communications* may be a sub-code of *Correct usage of formal project communication procedures).* Fewer misconceptions must result in a more accurate understanding of the communicated project goals.

T.M.5

Relationship between: *Level of understanding of overall project goals* and *Overall collaboration between project stakeholders*

- Understanding what the project's goals are will enable stakeholders to collaborate more effectively than if they do not understand what their overall aim is. This understanding will help to reduce confusion as to what is required to achieve project goals.
- The above assumes that the stakeholders are motivated and want to collaborate. Is this a sub-category? (desire to achieve project goals?)

T.M.6

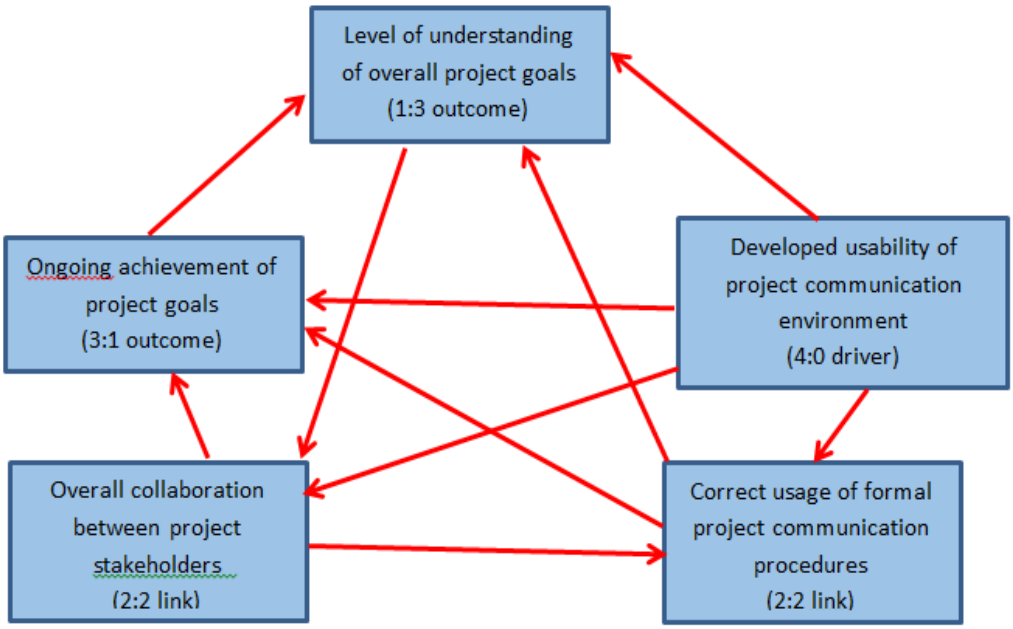
Relationship between*: Ongoing achievement of project goals* and *Level of understanding of overall project goals*.

- As project goals are achieved, the project starts to take shape. It is there for stakeholders to see. Seeing the emerging project will help the level of understanding.
- This has some relation also to the earlier code *period for which the project has been running*

Developed usability of project communications environment

- This is the core category. It accounts for the biggest variation in behaviour by project stakeholders.
- See the I.D. below showing the inter-relationships between categories.

Figure 5.3 *Interrelationship digraph*



- Each of the other four categories has a direct link to this category; i.e. it accounts for variation in every other identified category. No other category has this property.

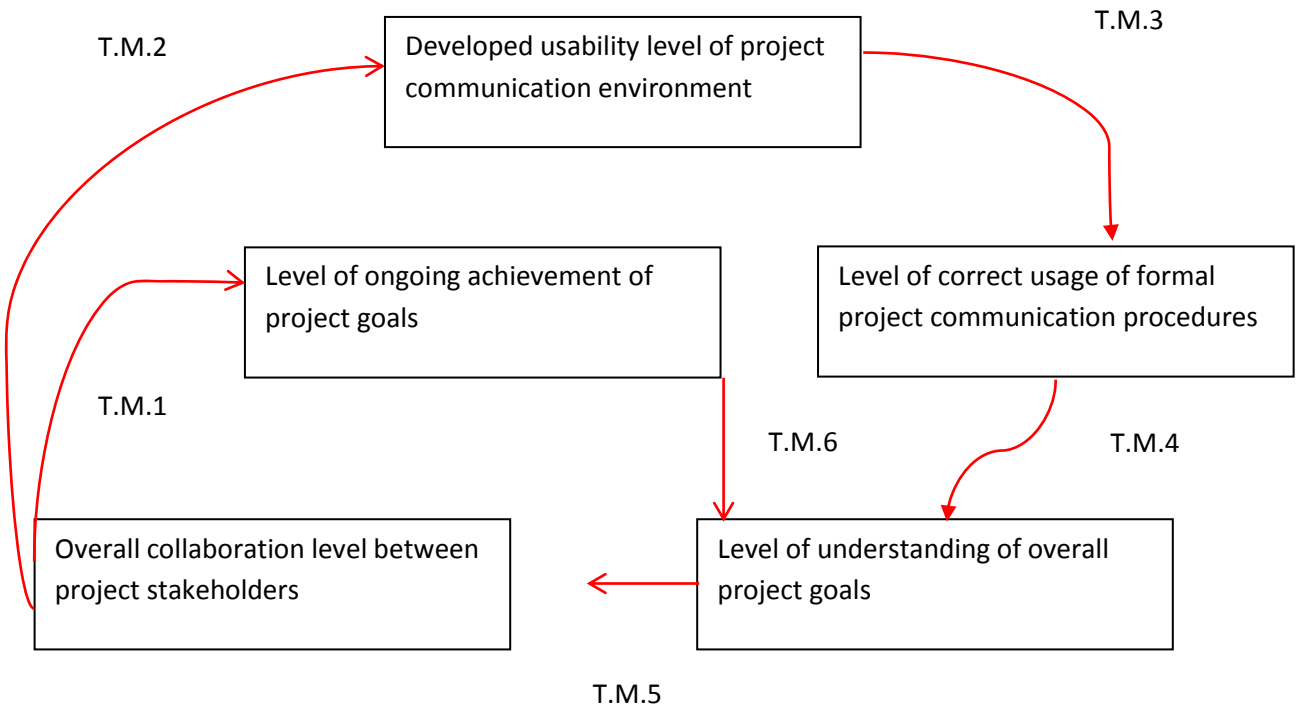
Coding with respect to the core category – Selective Coding.

9.7 Appendix 7: C.L.D. Provisional Theory.

A causal loop diagram to show the preliminary theory of effective construction project communication was developed from the above I.D. (See Fig 5.1 below).

Refer to the T.M.'s in the above section for motivation of the relationships between the codes.

Fig. 5.1 Preliminary theory of effective project communications



9.8 Appendix 8: Final Theory.

The final theory of effective project communications was developed from the theoretical codes that emerged during the final stage of data generation. The codes were grouped and classified in the same way as the open codes were. Picture 2 below shows the arrangement of codes into categories.

The interrelationships between the theoretical codes' interrelationships were established with the helpm of an interrelationship digraph. (Figure 5.2 below)

A C.L.D. was developed from the I.D. The C.L.D., which is the representation of the final theory is shown below. (Figure 5.3), followed by the arguments supporting the interrelationships

Figure 5.2. Interrelationship Digraph.

Drivers/outcome relationship is shown in red in the code blocks.

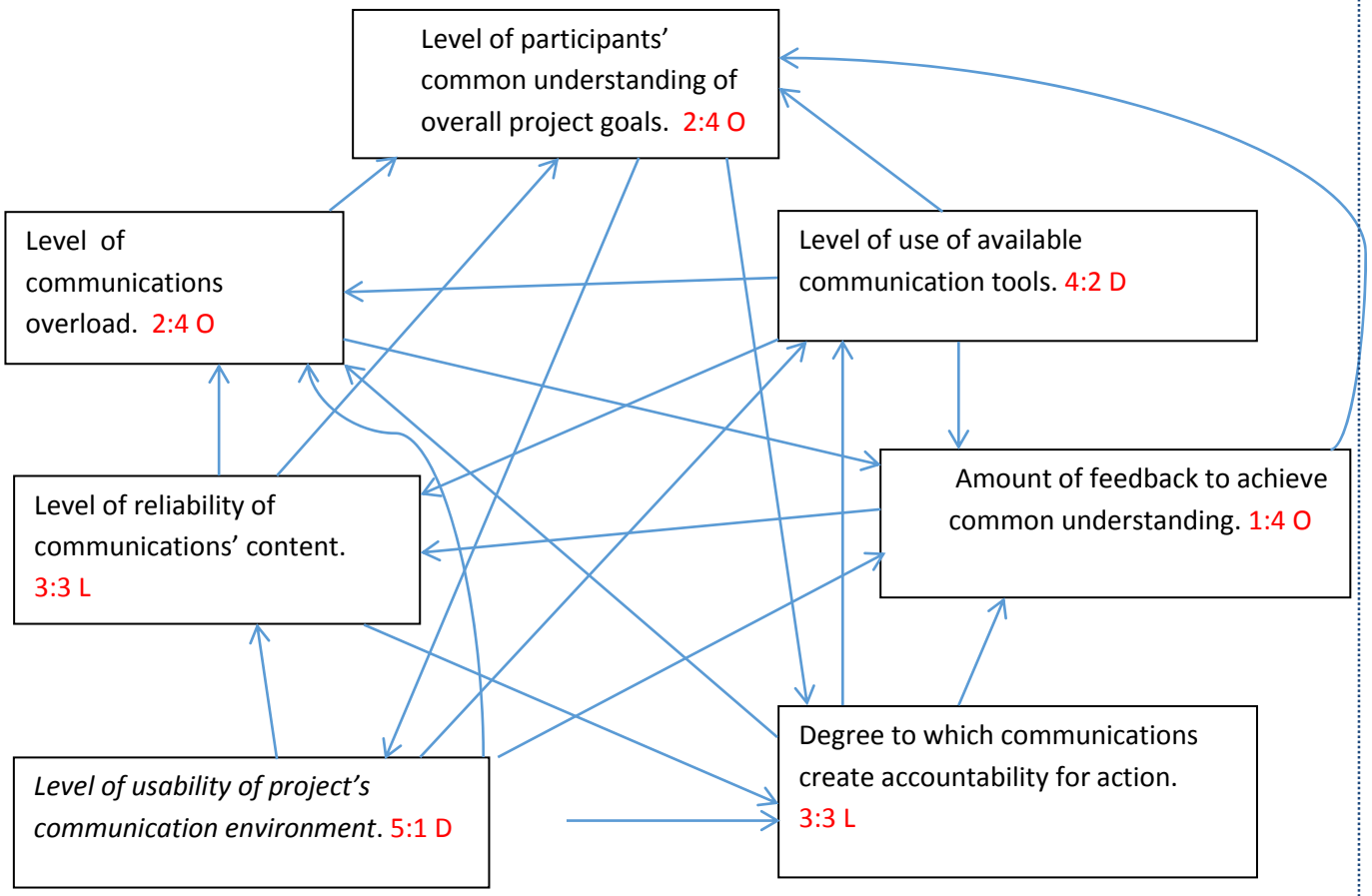
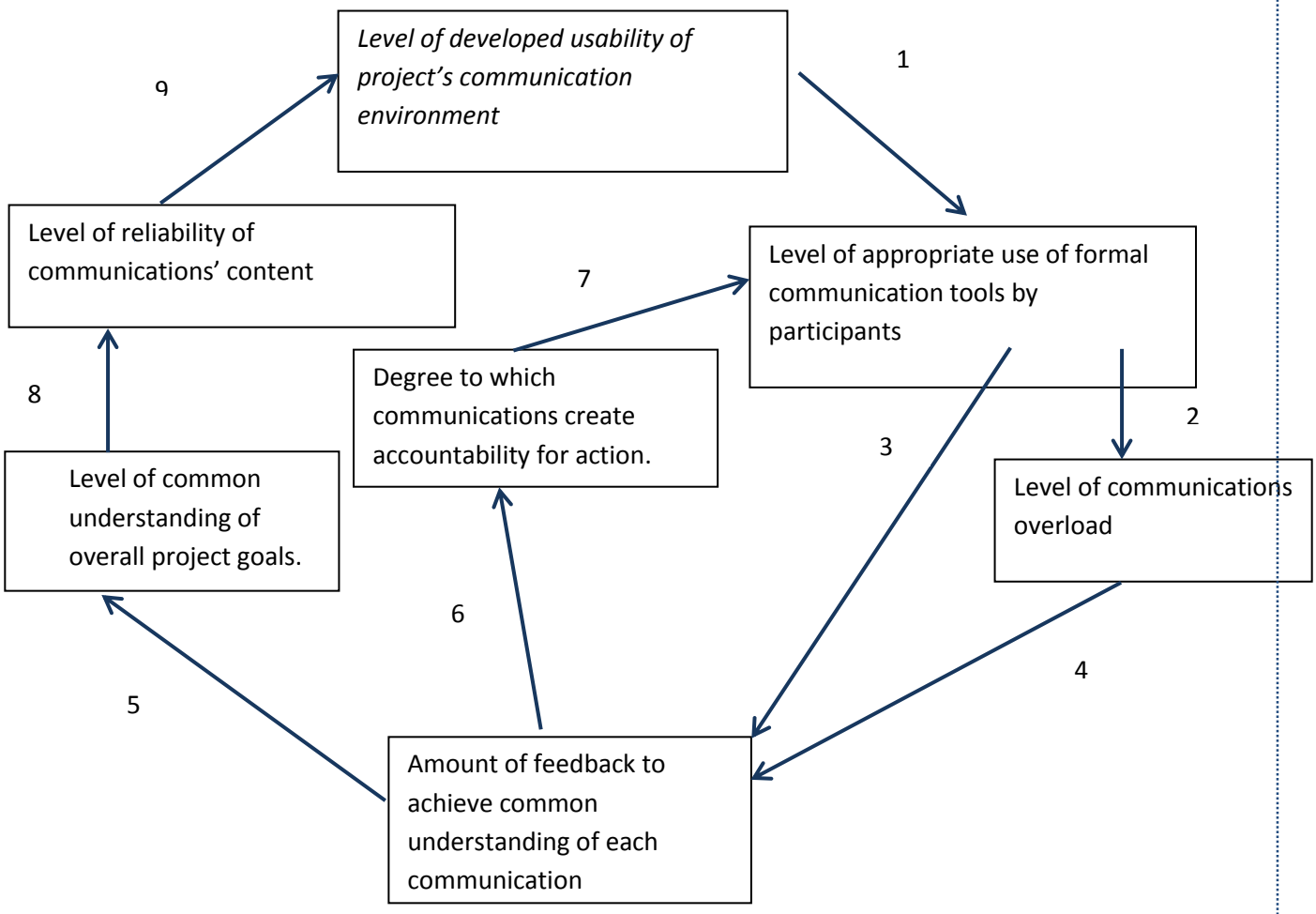


Figure 5.3. C.L.D. representing the final theory of effective construction project communications.



Supporting Arguments.

Construction project communication environments are made difficult to operate in by, among other factors, the different mind-sets, jargons and goals of the different groups involved. The fact that projects are temporary organizations which involve these groups coming together for short periods without the opportunity to get used to one another's unique methods and language further detract from the usability of a project's communication environment. (Dainty, Communication in Construction. Theory and Practice, 2006, p. 2) (Packendorff J. , 1995, p. 323)
The usability (how easy and convenient it is for all participants to effectively use the available channels of communication) of a project's communication environment will have a strong effect on the degree to which users make appropriate use of the tools intended for the purpose of sending and receiving these project communications. In his 2007 study, Wijkforss found that users of a project information communication technology (ICT) system avoided using the system as they perceived that it wasted time, was overly complicated and required them to leave the construction

site so that they could be at their computers in their offices. Users felt that time spent logging on was wasted and information was difficult to find in the system. They therefore used the network system as little as possible and started using other more immediate and direct forms of communication. The network was simply used as a store of information and did not act as a two way communication system for project communications related to necessary activities. (Wikforss, 2007, p. 4).
Small and medium professional firms have been found to be reluctant to adopt ICT systems. Usability factors such as incompatibility between ICT systems being used on the same project are cited as being among the causes of reluctance by project staff to use communication tools. (Dainty, Communication in Construction. Theory and Practice, 2006, pp. 204, 218)

Both the quantity and quality of communications generated within the project environment correlate with the effectiveness of project organization. (Packendorff J. , 1995, p. 323) Correct use of the available communication tools will have an effect on both the number and quality of communications participants need to deal with. Provided the formal communications tools of a well-designed system (e.g. document stores, group emails etc.) are used judiciously by senders, a reduction in the number of communications sent and time spent attending to them would result. Extracting the required information and understanding from each communication would be more efficient due to the consistent format. Fewer informal communications would take place (see above) and this would reduce the chances of duplication and conflicting instructions being transmitted.
It should be noted however that project participants' ability to easily generate a great deal of communications may result in an over-supply of un-needed information and users of the system becoming overloaded with information. Thus communication technology should be used judiciously so that this situation does not arise. (Dainty, Communication in Construction. Theory and Practice, 2006, p. 39)

The level of use of formal communication tools by project participants will also have an impact on the amount of feedback received. If all users of the communications systems use them appropriately, information is more likely to flow both ways between sender and recipients. Note that systems should allow for informal verbal discussion as a component which will facilitate common understanding. Formal recorded information exchange can take place while unrecorded verbal conversations are used to align and create understanding. (Wikforss, 2007, p. 5)
The above mentioned "communication overload" is another factor that will affect an individual's capacity to take in, process and attend to each communication thoroughly. Efficient two way communication by means of the appropriate use of the available formal communication tools without unnecessary additional conversations will reduce the time spent to achieve common understanding. If, however some of the project participants do not use the communication tools available, informal unrecorded communications with inaccurate content and which do not flow through the management hierarchy may become commonplace. Common understanding between all stakeholders may not be achieved in this environment, resulting in mistakes and a lack of accountability.
It should be accepted, that some spontaneous, informal communication will always take place, especially when there is time pressure during the execution of a project. . Two way communication does however engender a spirit among participants of community and trust which will facilitate all communications, formal or informal. (Frame, 1995, p. 61) However if the formal means of communication are used to confirm these un-recorded verbal communications, misunderstandings

will be prevented. (Dainty, Communication in Construction. Theory and Practice, 2006, pp. 27, 185, 199)

Among the reasons for communications failing is information overload (when a person's capacity to fully process information at the rate required is exceeded). This would reduce the amount of two way communication and hence full understanding and alignment by both parties. (Dainty, Communication in Construction. Theory and Practice, 2006, p. 27)

The common understanding by participants of overall project goals will be affected by the amount of feedback (two way communication) that takes place in order to achieve common understanding of each communication. Two way communications will allow misunderstandings to be cleared and errors to be discovered and corrected.
ICT based communication systems for example are at risk of limiting participants' overall understanding due to their one-way communication characteristic, where information is centrally stored or sent by email. Participants often access information from this source as and when they need it without any discussion or feedback process taking place. The design of such a system should be flexible enough to facilitate free discussion as well as easy acknowledgement and feedback tools. This discussion environment is required for the understanding demanded by complex projects. (Wikforss, 2007, pp. 3, 5)

Communication must include a two way process in order to ensure that the transmitter knows the communication has been received and understood. If there are mistakes in a message, feedback or discussion will expose this and the mistake can be addressed. (Torrington, 1998, p. 112) Such a process will help to ensure the reliability of communicated information. Cumulatively these mutually understood messages will improve the level of common understanding of overall project goals. (Wikforss, 2007, p. 3)

If effective two way communication between sender/recipient takes place, there will be common understanding of what actions are required, allowing project participants to collaborate effectively, creating agreement as to which group or individual is responsible, thus accountable for the required outcome. (Dainty, Communication in Construction. Theory and Practice, 2006, p. 37)

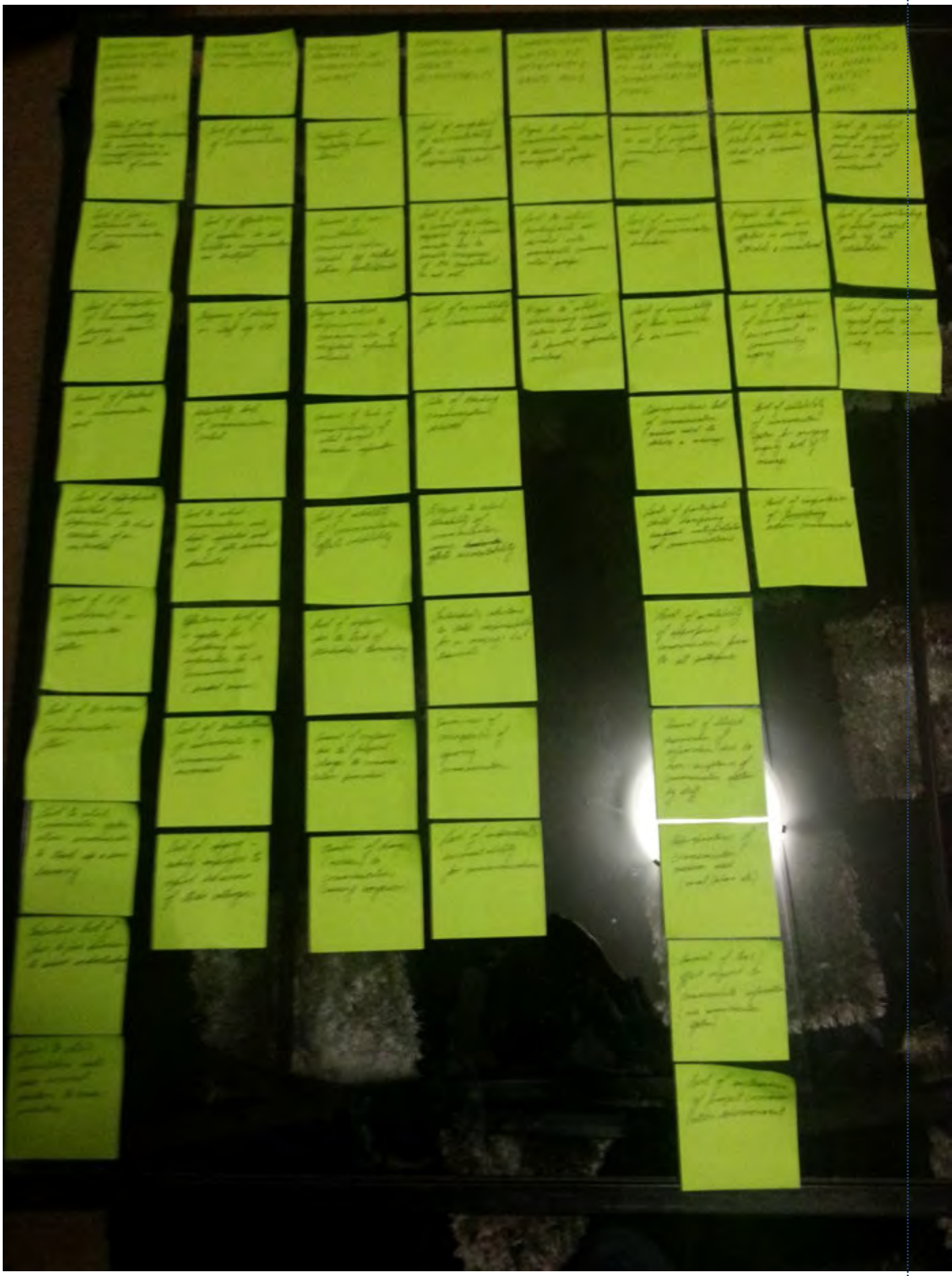
The degree to which communications create accountability for action will influence the level of use of available communication tools by participants. Project participants sending messages will want to create this accountability to ensure that their requirements are carried out. In the busy construction project environment, using a formal, traceable communication s medium is an efficient way of putting this accountability in place and on record. When a participant is made accountable for an action he will be more inclined to use formal recorded means of communication to provide his feedback as the required actions are executed. If project some participants circumvent the established formal communication channels dictated by the organisational hierarchy, then responsibility and accountability cannot be determined. Defined responsibilities by participants for outcomes is associated with an effective structured communications environment. In his report on the Scottish Parliament project, Black praised the project execution plan as a document that among others comprehensively set out responsibilities and lines of communication. (Dainty, Communication in Construction. Theory and Practice, 2006, pp. 48, 199)

A high level of common understanding of overall project goals will improve the reliability of the content of individual communications. Communications will be created and seen in the context of overall project goals which will assist in the correct message being sent and understood. Wikforss' study of the effects of ITC on project communication found that if overall understanding of the project was reduced and participants formed their own "pre-image" of the overall project. It was not possible to decide who should receive information and when. (Wikforss, 2007)

Level of reliability of communications' content will affect the level of usability of the project's communication environment. If owners of information are not confident of its accuracy and reliability, they may hold back on making it available to those project participants who need it. This will limit the usability of the communications environment due to incompleteness of information available. Last minute corrections that have to be made once information has been published will also result in compromised usability of the communications environment for the same reason. Conversely, disseminated information that has been discussed and agreed upon by participants will be perceived as reliable and will engender a spirit of trust and cooperation, improving confidence and strengthening the usability of the project communication environment. (Frame, 1995, p. 61) (Wikforss, 2007, pp. 3,5)

Thus, if participants feel that communications that are sent or received are trustworthy and reliable then a higher degree of trust in the general communications environment of the project will develop. This feedback will create a virtuous cycle and the usability level of the project's communication environment will improve as the project proceeds.

Picture 2.



9.9 Appendix 9: Field Observations

See separate attachment (Observations).

9.10 Appendix 10: Interview Transcripts.

See separate attachment (Interviews)

9.11 Appendix 11: Ethics Questionnaire.

EBE Faculty: Assessment of Ethics in Research Projects

Any person planning to undertake research in the Faculty of Engineering and the Built Environment at the University of Cape Town is required to complete this form before collecting or analysing data. When completed it should be submitted to the supervisor (where applicable) and from there to the Head of Department. If any of the questions below have been answered YES, and the applicant is NOT a fourth year student, the Head should forward this form for approval by the Faculty EIR committee: submit to Ms Zulpha Geyer (Zulpha.Geyer@uct.ac.za; Chem Eng Building, Ph 021 650 4791).
Students must include a copy of the completed form with the thesis when it is submitted for examination.

Name of Principal Researcher/Student: John Freeman Department: Mechanical Engineering

If a Student: Degree: M.Eng Supervisor: Corrinne Shaw

If a Research Contract indicate source of funding/sponsorship: N.A.

Research Project Title: Effective Construction Project Communications

Overview of ethics issues in your research project:

Question 1: Is there a possibility that your research could cause harm to a third party (i.e. a person not involved in your project)?	YES	NO x
Question 2: Is your research making use of human subjects as sources of data? If your answer is YES, please complete Addendum 2.	YES x	NO
Question 3: Does your research involve the participation of or provision of services to communities? If your answer is YES, please complete Addendum 3.	YES	NO x
Question 4: If your research is sponsored, is there any potential for conflicts of interest? If your answer is YES, please complete Addendum 4.	YES	NO

If you have answered YES to any of the above questions, please append a copy of your research proposal, as well as any interview schedules or questionnaires (Addendum 1) and please complete further addenda as appropriate.

I hereby undertake to carry out my research in such a way that

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name and signature	Date
Principal Researcher/Student:	John Garthe Freeman	12/10/2010

This application is approved by:

Supervisor (if applicable):		
HOD (or delegated nominee): Final authority for all assessments with NO to		

all questions and for all undergraduate research.		
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.		

ADDENDUM 1:
Please append a copy of the research proposal here, as well as any interview schedules or questionnaires:

Research Proposal.

Presented to the University of Cape Town

By

John Freeman – Student No. FRMJOH003

For

Corrinne Shaw.

Date 13/08/2010

Effective Construction Project Communications.

(Effective sharing of information within and outside the project team.)

Goals:

Why is my study worth doing? Communication is a very important (maybe the most important) component of project planning and execution. A lack of effective communication between stakeholders can severely hamper the progress and quality of a project. This study will examine the communication process within projects and between project teams and external stakeholders and its effect on project success.

Issues to be clarified by the study:

- Formal communication systems' structure and effectiveness.
- Changing communications systems as project progresses through its phases.
- The role of informal communication in a project.
- Environments for effective communication.

Practices and policies to be influenced:

- Project meetings and their design.
- Progress monitoring.

- Information technology communication systems and how they are used in the project environment.
- Inter disciplinary design boundary delineation.
- Informal communication environments

Why do I want to conduct this study?

- To create knowledge that will help in the efficient management of projects.
- To create transferrable knowledge that can be used in appropriate situations by others.
- To use this knowledge to influence existing project management systems in my company.

Why should others care about the results?

- Knowledge which can improve the project execution process can be applied by anyone in that field.
- Communication is an important part of any endeavour involving more than one stakeholder. The knowledge is likely to be transferrable to other environments.

Conceptual Framework.

What do I think is going on with the issues, settings or people to be studied?

- Numerous communications take place between project team members daily. These may be by means of spoken, telephonic, email or other means. These conversations lead to decisions being made and obligations arising as a result. Deliverables have to be produced on time and to specification otherwise other parts of the project will be adversely affected.
  Defects and deficiencies in the communication process often seem to be the root cause of deliverables not being produced correctly or on time.
  I think that improvements to the systems of communication have the potential to greatly reduce the problems that arise during project execution.

What theories, beliefs and prior research findings will guide or inform my research and what literature, preliminary studies and personal experience will I draw on to understand the people or issues being studied?

- (Packendorff J. , Inquiring Into the Temporary Organization, 1995) theory that projects should be viewed as temporary organisations.
- (Aucoin B.) Theory of "Right Brain Project Management" which emphasises the value of compelling motivation as a means of achieving project success.
- Value of informal communications play a greater role in the overall communication environment than they are given credit for.
- Continuous monitoring rather than periodic milestone checks.
- Small Wins 2 Module 2 results will help my understanding.

- Various work related experiences, some documented in my critical incident log.

Research Question.

How can project team communication systems be optimised to ensure that all stakeholders have all the information required to function efficiently and effectively?

What specifically do I want to understand by doing this study?

- How effective various communication systems are in their contexts.
- Are different means of communication more appropriate when dealing with different individuals? How do I decide?
- What 'roadblocks' stop project team members and outside stakeholders from acting appropriately on communications? How can these be overcome?
- Is ineffective communication blamed for lack of appropriate action when other factors such as lack of motivation or skills are to blame?
- How does the project manager detect shortcomings in the project communications system?
- What part do informal communication systems play in the overall communication process? Does this mean that the formal communication system for a project must be shaped according to social groupings and physical location factors present in each project team?
- Are different communication systems required for different sizes and types of projects?

Rationale

A project that is not efficiently conceptualised and executed has negative consequences for all stakeholders. For the owners of the resulting asset, in the case of engineering projects, the additional financial costs of a poorly conceptualised or executed project can amount to billions of rands.

Projects delivered late may result in lost opportunity costs for the owners (e.g. a shop that opens late after an advertising campaign promised special opening offers on a specific date)

Communication has been identified by initial research (see literature review below) and personal observation to be a very important component of project conceptualisation and execution.

Initial research on project communication produced articles which highlighted the importance of effective communications in the project environment e.g. (Dainty, Communications in Construction: Theory and Practice, 2006).

(Aucoin M. , 2007), states: 'Good communication and common understanding are critical to project success, and poor communication is a pervasive problem'

This research will increase my knowledge and understanding of the subject, which can then be applied to improve my effectiveness as a project manager.

The knowledge generated should be transferable and could be used by others in other environments.

Literature review.

One has to bear in mind that different stakeholders in a project will have different world views and in some cases will want details of different aspects of the project progress. This is confirmed by (McGhee P. M., 2007) who argues that ' the sponsor, stakeholders and clients all want to know what was accomplished this period, what they have to look forward to completing in the near future, and what issues exist that could negatively impact the project.' .....'Whether delivering information on the project in an email, on the phone, or in person, the project manager needs to carefully navigate the ground between too much information and too little information.'

Some of the basic tools of communication are tabulated below with each one's advantages listed.

Table 1: Communication Mechanisms (from McGhee and McAliney, 2007)

email	Phone	In person
Communicate quickly and concisely	**Access someone conveniently**	**Reduce potential for miscommunications**
Share information without interrupting the recipient	**Communicate when internet or face to face unavailable**	**Convey message with 'complete 'communication (body language, voice inflection, facial expression)**
Have a record of shared information for future use	**Receive an immediate response**	**Build relationship and establish rapport**
Share a message 24/7		
Save money on postage; easier than fax or mail. Share message with many		

These mechanisms can be used for communication, but the simple mechanical conveying of a message to a person does not guarantee that it will be received and interpreted and acted on appropriately.

It is extremely important to the communication system that the project manager (and perhaps others in the project team) has the inter-personal and communication skills to overcome possible personality clashes between stakeholders. As (Aucoin M. , 2007) says: 'Managing communication of this information through the network of relationships while at time can be challenging is a very important activity that needs to occur. A project manager needs to be able to communicate with all people on the project delivery team, the clients and many others, both within and outside the organisation'.

According to (Aucoin B.) the emotional intelligence level of the project manager is a major contributor to effective communication. Research has shown that higher levels of emotional intelligence in the project manager are linked to improved project performance. Individuals with higher levels of emotional intelligence have also been shown to be more effective in the matrix organisations that many companies use to organise projects. This linkage makes sense because so many of the issues involved in making a project a success involve the 'soft' issues or 'people' issues.

This emotional intelligence would relate among other things to one's ability to communicate with others.

Table2: Goleman's Five Elements of Emotional Intelligence:

Knowing one's own emotions	**The ability to identify one's emotions, to understand links among emotions, thoughts and actions**
Managing emotions	The capacity to manage one's emotions; to control emotions or to shift undesirable emotions to more effective ones
Motivating oneself	The ability to shift into emotional states by choice; to summon emotions toward the attainment of goals
Recognising emotions in others	The capacity to emphasize; to read and be sensitive to, other people's emotions
Handling relationships	The capacity to satisfactory and beneficial relationships; to lead and influence the emotions of others.

(Aucoin B.) further states that contemporary projects inevitably encounter complexity and ambiguity; hence the outcome becomes more indeterministic. The result is considerable stress for the project manager when trying to make sense of it all.

Adding to this argument, (Aucoin B.) refers to the way in which the brain interprets verbal inputs.

The left brain processes the literal meaning of words. The right brain processes inferred meaning, tone inflection and body language. The left brain processes information for logical and factual content, while the right brain processes information for emotional and conceptual content.

(Aucoin B.) arguments confirm the assertion that communication is not by means of the spoken or written word only.

Evidence of the importance of communications as a component of project management is strengthened by, the following extract from the Chevron Project Management Handbook:

'It is often quoted that an effective project manager spends 80 to 90% of his or her time communicating. It is easy to understand then why communications and information management is such a critical factor in achieving project success. It is especially critical on large, complex projects where numerous channels of communication exist among many stakeholders and there is a high probability that important information will get lost. While it is the responsibility of each stakeholder to assure that he or she communicates effectively with others, it is the project manager's responsibility to verify that a process exists to facilitate these communications' and 'Research confirms that most projects do not under perform or fail because of some deficiency in technical skills. When projects run into difficulty, the primary reasons are most often traceable to the 'softer' or 'people' issues.'……project managers need to become and remain proficient in such areas as:

- Getting a team up and running
- Designing and managing a team communication process
- Encouraging, inspiring and improving the project team
- Identifying the problems and eliminating root causes
- Avoiding hidden traps in decision making
- Providing performance feedback and coaching
- Applying relevant and realistic motivational strategies
- Resolving conflict non-destructively
- Influencing with integrity and effectiveness
- Building trust and credibility
- Developing higher levels of emotional intelligence
- Leading a cross-cultural workforce

Most of the above proficiencies involve communication between the project manager and one or more recipients.

Not all communication flows through the formal channels envisaged by the project. Some information flows through other 'informal' channels. As Dainty et al (2006) states 'No matter how much effort is put into the design and planning process, as soon as the production work at the construction site starts all kinds of problems and issues arise that calls for immediate attention. In this constant reactive production environment, handling problem situations result in natural communication patterns that are dynamic, spontaneous and informal' (Dainty, 2006)

Conceptual Framework.

Formal project communications will travel along paths determined by the formal structure of the project team. The suitability of various structures will be examined.

Research Design.

Information will be gathered by means of:

- Reference to books, scholarly articles and possibly company project procedure manuals.
- Internet searches will be conducted for useful material, and used if reliability can be established.
- Data will be gathered from interviews with contractor and client staff. Project and client staff at a range of levels will be interviewed and responses analysed and used as inputs.
- Observations will be possible during the execution of my current project that will provide useful empirical data as to the effectiveness of current communication systems.

Analysis of Data.

Care will have to be taken that data gathered is relevant to the type of project being studied. The context of all data will have to be tested against a set of criteria (to be established) so as to guarantee that casual factors do not influence the findings.

Interview questions will need to be carefully crafted so as not to draw the interviewee toward a particular response. Answers will be tested against a set of criteria (to be established) that will reveal personal bias on the part of the interviewee.

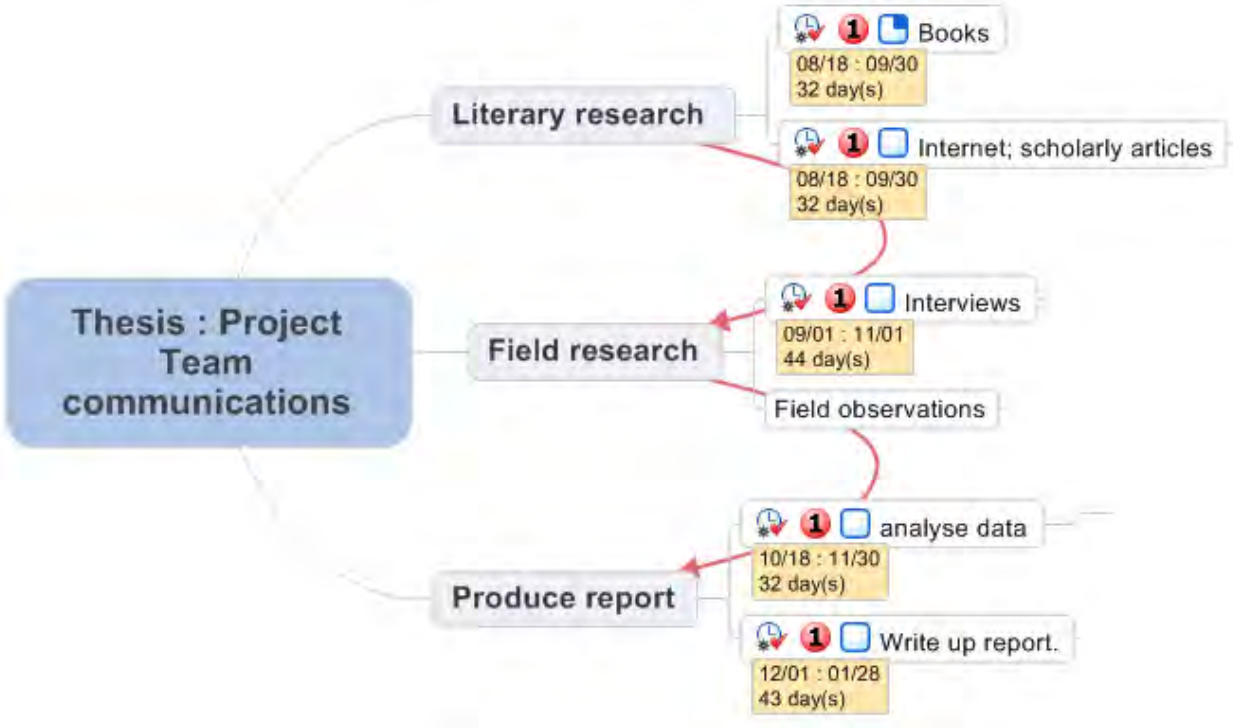
Ethics.

The 'Guide to Research Ethics' on the UCT website was used as a guideline for research to ensure that all research is conducted in an ethically acceptable manner (see also Appendix 6 'Ethical Clearance, J. Freeman' and 'EBE Faculty: Assessment of Ethics in Research Projects').

Time Line.

A high level schedule is shown below in Mindjet format.

A more detailed schedule will be developed in MS Project format once initial research reveals more detailed requirements.



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Appendices:

1. Information Sheet.
2. Consent Form.
3. Questionnaire.
4. Methods to be applied (see Information Sheet).
5. Data security statement (included in Information Sheet).
6. Ethical clearance for J. Freeman and E.B.E. Faculty: Assessment of Ethics in Research Projects.

ADDENDUM 2: To be completed if you answered YES to Question 2:

It is assumed that you have read the UCT Code for Research involving Human Subjects (available at http://web.uct.ac.za/depts/educate/download/uctcodeforresearchinvolvinghumansubjects.pdf) in order to be able to answer the questions in this addendum.

2.1 Does the research discriminate against participation by individuals, or differentiate between participants, on the grounds of gender, race or ethnic group, age range, religion, income, handicap, illness or any similar classification?	YES	NO x
2.2 Does the research require the participation of socially or physically vulnerable people (children, aged, disabled, etc) or legally restricted groups?	YES	NO x
2.3 Will you not be able to secure the informed consent of all participants in the research? (In the case of children, will you not be able to obtain the consent of their guardians or parents?)	YES	NO x
2.4 Will any confidential data be collected or will identifiable records of individuals be kept?	YES	NO x
2.5 In reporting on this research is there any possibility that you will not be able to keep the identities of the individuals involved anonymous?	YES	NO x
2.6 Are there any foreseeable risks of physical, psychological or social harm to participants that might occur in the course of the research?	YES	NO x
2.7 Does the research include making payments or giving gifts to any participants?	YES	NO x

If you have answered YES to any of these questions, please describe below how you plan to address these issues:

ADDENDUM 3: To be completed if you answered YES to Question 3:

3.1 Is the community expected to make decisions for, during or based on the research?	YES	NO
3.2 At the end of the research will any economic or social process be terminated or left unsupported, or equipment or facilities used in the research be recovered from the participants or community?	YES	NO
3.3 Will any service be provided at a level below the generally accepted standards?	YES	NO

If you have answered YES to any of these questions, please describe below how you plan to address these issues:

9.12 Appendix 12. Completed Ethics Questionaire

Ethical Clearance for

Research Involving Human Subjects

Section A – Proposal & researcher details

1. Title of the proposal:

Effective Project Team Communications.

(Effective sharing of information within and outside the project team.)

2. Has this protocol been submitted to any other Ethical Review

Committee (REC)?

~~*Yes*~~ */ No*

2.1 If so, list which institutions and any reference numbers

N.A.

2.2 What was/were the outcome/s of these applications?

N/A.

3. Is this proposal is being submitted for ethical clearance for research related to or expanding on research previously approved by the Faculty of Humanities REC?

~~*Yes*~~ */ No*

3.1 If so, what was the previous REC reference number?

N/A.

4. Researcher Details

4.1 Principal Researcher:

Title Initials & Last Name Department and Institution

Mr. J.G. Freeman, Dept of Mechanical Engineering, University of Cape Town.

Phone: 083 417 1982 / 021 556 4265

Email: johnfreeman55@hotmail.com

Signature

Date: 19 September 2010

4.2 UCT Principal Researcher (If different to 4.1 above) – *N.A.*

4.3 Co-researchers: N/A.

5. Is the research being undertaken for a higher degree? *Yes / ~~No~~*

If yes,

5.1 What degree? *M.Eng.*

5.2 Student name: *J. Freeman*

5.3 Supervisor name: *C. Shaw*

5.4 In what department is the degree? *Dept. of Mechanical Engineering.*

Section B – Checklist:

Detailed research proposal 3 hard copies + electronic copy

Covering letter and all other relevant correspondence 3 hard copies + electronic copy

Consent forms (include translations if indicated) 3 hard copies + electronic copy

Subject/s information sheet (if separate from consent form) 3 hard copies + electronic copy

Approval from Head of Department or Research Grouping (signature)

Departmental stamp

Section C – Research information

15. Estimated number of participants: *9*

16. Estimated duration of study: *2 months*

17. Location of study: *Foster Wheeler Head Office, Midrand and Sasol Project Offices.*

Section D – Financial and Contractual Information

18. Is the study being sponsored or funded? ~~*Yes*~~ */ No*

If yes

19.1 Who is the sponsor/funder of the study? *N.A.*

19.2 What is the total budget / sponsorship for the study? *N.A.*

19.3 Into what fund is the sponsorship being paid? *N.A.*

19.5 Are there any restrictions or conditions attached to publication and/or presentation of the study results?

Yes / ~~*No.*~~ *Sasol and Foster Wheeler data protection requirements will have to be respected.*

19.6 Does the contract specifically recognise the independence of the researchers involved?

~~*Yes / No*~~ *– N/A. No contract.*

(Note that any such restrictions or conditions contained in funding contracts must be made available to the Committee along with the proposal.)

Section E - Statement on Conflict of Interest

The researcher is expected to declare to the Committee the presence of any potential or existing conflict of interest that may potentially pose a threat to the scientific integrity and ethical conduct of any research in the Faculty. The committee will decide whether such conflicts are sufficient as to warrant consideration of their impact on the ethical conduct of the study.

Disclosure of conflict of interest does not imply that a study will be deemed unethical, as the mere existence of a conflict of interest does not mean that a study cannot be conducted ethically. However, failure to declare to the Committee a conflict of interest known to the researcher at the outset of the study will be deemed to be unethical conduct.

Researchers are therefore expected to sign either of the two declarations below.

a) As the Principal Researcher in this study (name: *John Freeman*), I hereby declare that I am not aware of any potential conflict of interest which may influence my ethical conduct of this study.

Signature: _____ Date: _____

b) As the Principal Researcher in this study (name: _____),

I hereby declare that I am aware of potential conflicts of interest which should be considered by the Committee:

Signature: _____ Da

Completed signed UCT EBE Faculty Ethics Form.

EBE Faculty: Assessment of Ethics in Research Projects

Any person planning to undertake research in the Faculty of Engineering and the Built Environment at the University of Cape Town is required to complete this form before collecting or analysing data. When completed it should be submitted to the supervisor (where applicable) and from there to the Head of Department. If any of the questions below have been answered YES, and the applicant is NOT a fourth year student, the Head should forward this form for approval by the Faculty EIR committee: submit to Ms Zulpha Geyer (Zulpha.Geyer@uct.ac.za; Chem Eng Building, Ph 021 650 4791). Students must include a copy of the completed form with the thesis when it is submitted for examination.

Name of Principal Researcher/Student: John Freeman Department: Mechanical Engineering

If a Student: Degree: M.Eng Supervisor: Corrinne Shaw

If a Research Contract indicate source of funding/sponsorship: N.A.

Research Project Title: Effective Project Team Communications

Overview of ethics issues in your research project:

Question 1: Is there a possibility that your research could cause harm to a third party (i.e. a person not involved in your project)?	YES	NO x
Question 2: Is your research making use of human subjects as sources of data? If your answer is YES, please complete Addendum 2.	YES x	NO
Question 3: Does your research involve the participation of or provision of services to communities? If your answer is YES, please complete Addendum 3.	YES	NO x
Question 4: If your research is sponsored, is there any potential for conflicts of interest? If your answer is YES, please complete Addendum 4.	YES	NO

If you have answered YES to any of the above questions, please append a copy of your research proposal, as well as any interview schedules or questionnaires (Addendum 1) and please complete further addenda as appropriate.

I hereby undertake to carry out my research in such a way that

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

Signed by:

	Full name and signature	Date
Principal Researcher/Student:	John Garthe Freeman 	12/10/2010

This application is approved by:

Supervisor (if applicable):		
HOD (or delegated nominee): Final authority for all assessments with NO to all questions and for all undergraduate research.		
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.		

ADDENDUM 2: To be completed if you answered YES to Question 2:

It is assumed that you have read the UCT Code for Research involving Human Subjects (available at http://web.uct.ac.za/depts/educate/download/uctcodeforresearchinvolvinghumansubjects.pdf) in order to be able to answer the questions in this addendum.

2.1 Does the research discriminate against participation by individuals, or differentiate between participants, on the grounds of gender, race or ethnic group, age range, religion, income, handicap, illness or any similar classification?	YES	NO x
2.2 Does the research require the participation of socially or physically vulnerable people (children, aged, disabled, etc) or legally restricted groups?	YES	NO x
2.3 Will you not be able to secure the informed consent of all participants in the research? (In the case of children, will you not be able to obtain the consent of their guardians or parents?)	YES	NO x
2.4 Will any confidential data be collected or will identifiable records of individuals be kept?	YES	NO x
2.5 In reporting on this research is there any possibility that you will not be able to keep the identities of the individuals involved anonymous?	YES	NO x
2.6 Are there any foreseeable risks of physical, psychological or social harm to participants that might occur in the course of the research?	YES	NO x
2.7 Does the research include making payments or giving gifts to any participants?	YES	NO x

If you have answered YES to any of these questions, please describe below how you plan to address these issues: